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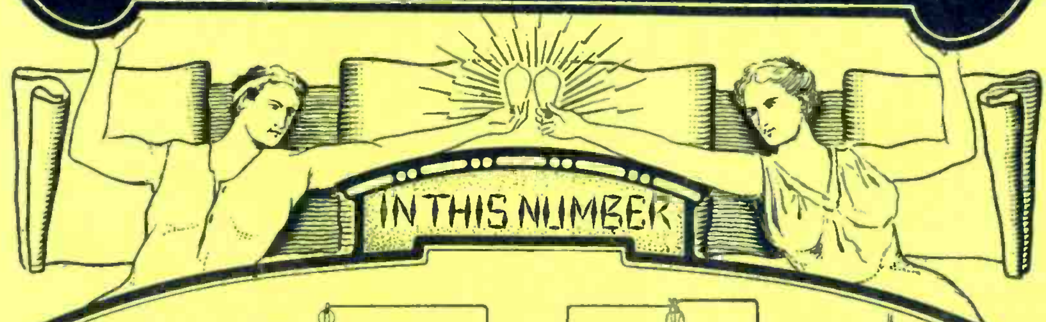

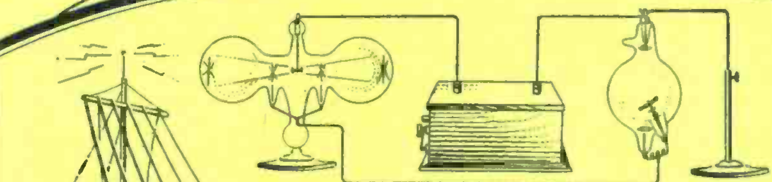

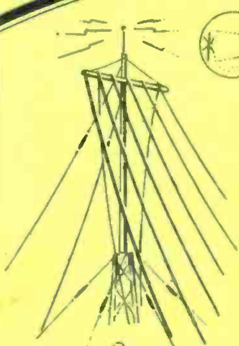

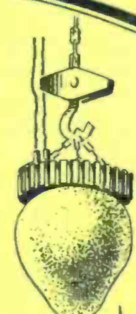

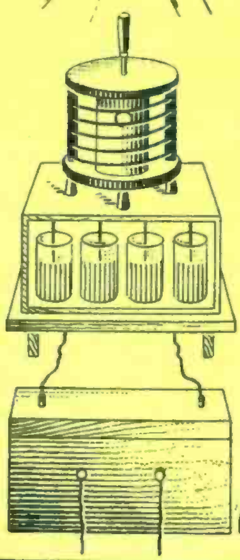

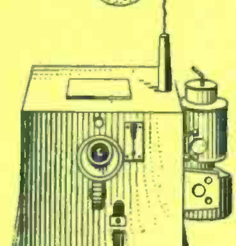

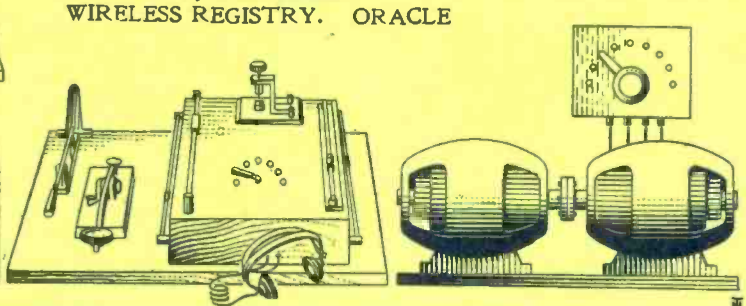

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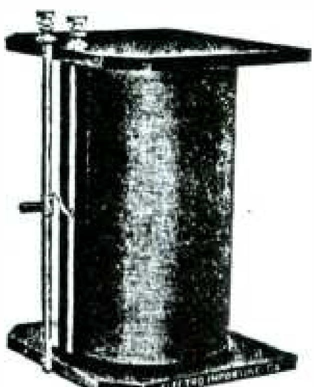

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MODERN ELECTRICS

Vol. II. APRIL, 1909. No. 1.

Majorana Aerophone Work

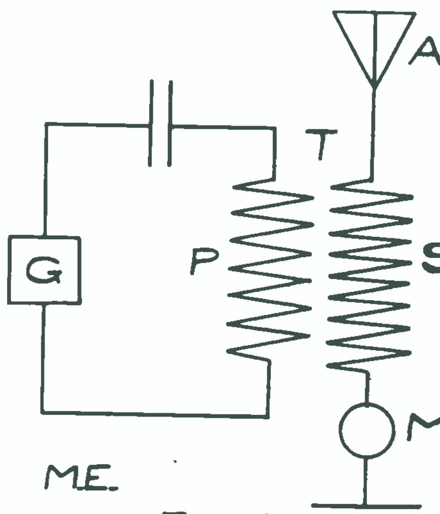
By A. C. Marlowe.

Paris correspondent Modern Electrics.

Prof. Majorana, of the Telegraphic Institute of Rome, is one of the leading workers on the Continent in the aerophone field, and he has been making experiments for some time past with his new transmitter, which he calls "hydraulic microphone." As the Italian Government is interested in having the system developed, the inventor used the different wireless posts which are operated by the Government, generally by the Marine Department, working from the Rome station as a center. In this way he is now able to cover a distance of 250 miles and more in his latest experiments, using in this case a station located in Sicily. In all this work he has been very successful, and this is largely due to the use of the new microphone. By the kindness of the inventor, I am able to give the readers of Modern Electrics an account of the most recent experiments and also a brief description of the apparatus, this being probably the first account to be published in America, as the last experiments, and especially the 250-mile transmission, were carried out quite recently.

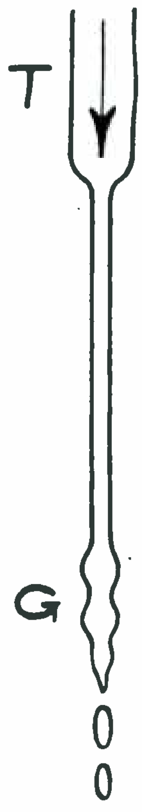
In Fig. 1 will be seen the arrangement of the transmitting apparatus, with the wave generator placed at G, and it is mounted in a circuit which contains a condenser C and the primary coil of a transformer T (this being made of two parallel inductances). Such a circuit is thus made to receive electrical oscillations of a certain period. The secondary of the transformer is mounted together with the antenna A and the microphone transmitter M: the other end of the microphone is connected to ground. Thus the microphone circuit enters into vibration by resonance. The two circuits which are shown here are arranged so that we have an exact concordance of the vibration periods in these circuits, this being obtained by making the proper adjustments of the apparatus. It is found much better to place the microphone at the point M than at any other point on the circuit. Were it placed in the circuit of the generator G, it would be obliged to carry a too heavy current, and on the other hand placing it between the secondary coil and the antenna we would have certain disadvantages owing to the position which the secondary would take between the microphone and the ground.

The success of Prof. Majorana's ex-



-FIG. 1-

periments is largely due to the kind of microphone transmitter which he uses, and it was designed by him for this purpose. A different principle from the ordinary is used here, and as the instrument uses the action of a liquid, it is known as the "hydraulic microphone." Its action will be clear from the present diagrams, Figs. 2 and 3. At T is a tube in which there is water or another liquid flowing in the direction of the arrow. As the bottom of the tube is contracted so as to give a small opening at this point the water will come out of the bottom of the tube in a somewhat fine stream. Such a stream continues in regular smooth form for some distance below the tube, and then at G it begins to break up and fall in drops. It is found that when we give a shock or other disturbance to the main tube, this favors the breaking up of the water stream to form drops, and the shocks, especially if they are sudden and frequent, act so as to shorten up the distance of the breaking point G from the tube end. The tube is also sensitive to sound vibrations, so that when a sound is made in the tube there is an action on the water stream which depends on the nature of the sound. Prof. Majorana was thus able to make the water column sensitive to the sounds of the human voice, but it was only after a considerable amount of experimenting that he succeeded in using such a device as a micro-

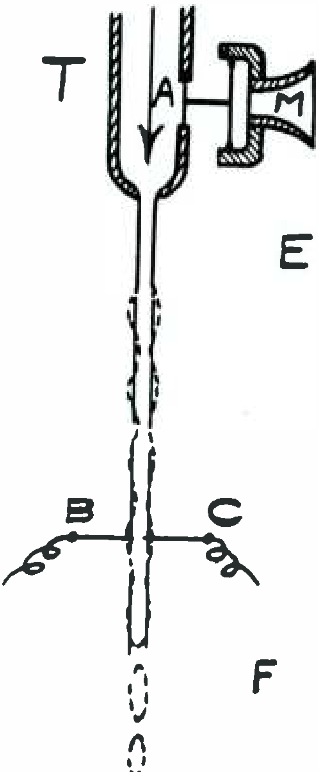


-FIG. 2.-

phone transmitter. This he carries out in the arrangement seen in Fig. 3, his design being to make the voice act directly on the water inside the tube so as to change the pressure, and this very near the lower opening of the tube. To do this, he makes the tube of a very strong and solid material, except at one part A, where he makes an opening and places across it a thin and elastic partition. This is connected by a cross rod with a diaphragm of the usual kind belonging to the transmitter mouthpiece M. Speaking into the mouthpiece or making any kind of sound will cause the diaphragm to vibrate, and this movement is transmitted to the liquid within the tube and has an action on the stream of water. In the usual condition of the stream when there is no sound made, there is a straight and unbroken water column from E to F, as the drops commence to form below F. However, when we make a sound of a given rate, such as a musical note, in the microphone, the water column is found to contract in a certain way, as seen in the dotted lines, and the contractions increase as we come to the lower part of the column near F. The drops commence to form higher up in this case.

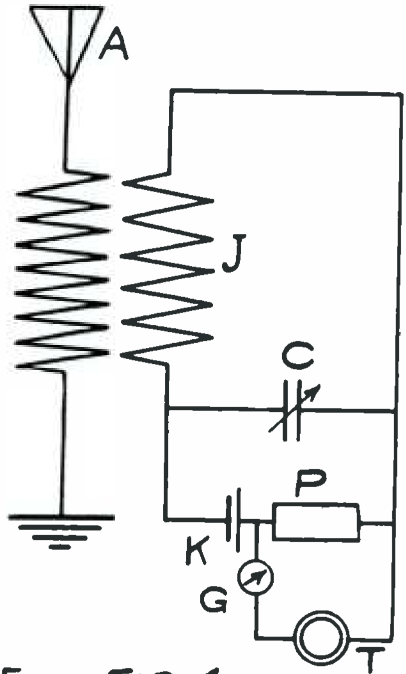
We insert a pair of fine wires B C in the column near the lower part where the contractions are the strongest, and they are connected across by the liquid. A current passing in the wires will thus depend upon the shape of the water column at this point, as when the stream is narrow we will have a higher electrical resistance between the points than when the stream is expanded out from the effect of the vibrations, as in the dotted lines. On the other hand, this action of the water is variable and depends on the kind of sound given in the microphone, so that the electrical resistance between the points depends on the sound in the transmitter. When we speak into the apparatus, we thus have a varying current in the line going from the points, and this current can be made to work an ordinary telephone receiver over a line. In fact, this was done not long since with great success, and the hydraulic microphone is found to be much stronger than the usual kind, as it will carry a heavier current. Experiments were made with it between Rome and London at a distance of 1,200 miles, and it showed a good performance, especially in the measurements of the amount of current which was sent over the line. A higher current than usual can be employed in this case, seeing that the part of the liquid which carries the current is always renewed, so that it does not heat up to any extent. We are also able to regulate the conductibility of the stream by changing the nature of the liquid (acidulated or salted water, mercury, etc.), and also the diameter of the stream, and we can furthermore adjust the distances between the metal points as well. For these reasons the new microphone is very well adapted for use in aerophony, and in fact it can be placed in the circuit of the antenna (Fig. 1) without any danger of burning or heating up.

For the apparatus in the receiving station, Prof. Majorana first tried a Marconi electro-magnetic detector, but found that it was not suited for the purpose, nor would a pair of carbon contacts or an electrolytic cell serve for receiving the waves. The proper apparatus for receiving the waves is either a bolometer on the thermo-electric principle or the audion of De Forest, and the latter gives the best results. He also uses the bolometer with success, and it is designed, as will be seen



-FIG. 3-
M.E.

in Fig. 4, using a thermo-electric couple of iron and platinum. The receiver antenna A is connected to ground through an inductance I, which can be adjusted. It sets up oscillations, by means of the second inductance J, in the circuit of the latter containing a variable condenser C. In shunt on the condenser is a second



M.E. -FIG. 4-

condenser K of very small capacity (a few millionths of a microfarad) in series with the thermo-electric couple P. Placed in shunt on the thermo-couple is a circuit having a telephone receiver T and a galvanometer G. When the waves from the first station arrive at the antenna, its circuit and also the second circuit receive oscillations, and a part of the energy passes in the thermo-couple. This becomes heated and it gives rise to a current, which passes in the circuit of the telephone receiver. The current is regulated by observing the galvanometer, which is sensitive for such currents. In this way the telephone receives currents which correspond to the waves sent out from the transmitting station, and the original sounds are reproduced at this end.

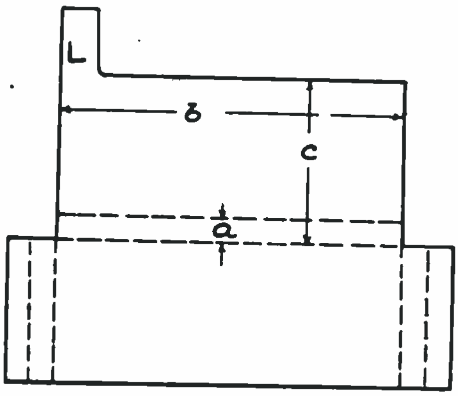
Prof. Majorana has been making experiments between Rome as a centre and a number of stations lying at various distances from the city in order to see what distance he can cover by the present method. The Italian Government, represented by the Minister of Marine, is interested in this work, and the central point is the Monte Mario wireless tele-

(Continued on Page 20)

A Cadmium Storage Battery

By H. Gernsback.

It is surprising to find that very few experimenters know of the Cadmium storage battery, and it is equally surprising that there is not to be found a single article on same in the technical press for several years back. This in spite of the fact that the Cadmium cell is perhaps the best one the experimenter could use, as it does not give rise to



M.E. -FIG.1-

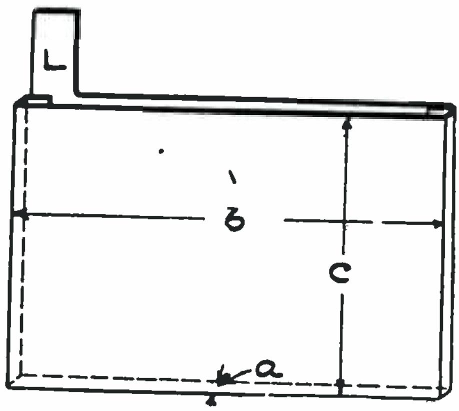
secondary action while idle, as for instance the regular storage battery. Not alone that, the Cadmium battery gives 2.30 volts average voltage, while the regular cell only gives 1.9-2.00 volts.

That these great advantages should have remained hidden to the average experimenters is a profound mystery to the writer, as there is absolutely no reason why the subject was neglected, considering its importance from the standpoint of the experimenter.

If we take the usual lead storage battery, composed of peroxide of lead as active matter for the positive, and spongy lead as active matter for the negative plate, both immersed in dilute sulphuric acid, it will be found that the cell discharges within one month to six weeks if left standing unused. If the cell is not a first class make and the acid not absolutely pure, the battery will frequently discharge within 10 days, notwithstanding it having been fully charged previously.

The reason for this is found in the local action between the negative and positive plates. As it is practically impossible to keep the electrolyte chemically pure, there are always currents passing between the plates of opposed polarity, which in time completely discharges a battery. The action is sometimes accelerated by formation of "mud" in the bottom of the cell, which, being a very good conductor, discharges the cell rapidly. This mud is usually formed of small particles due to "shedding" of the plates; in other words, small pieces of the active material of both plates falling away from their supports and accumulating at the bottom of the cell. If it were practicable to lift the plates out of the electrolyte while the cell is not in use, there could be of course no secondary action between the plates; however, this plan is not feasible, as the plates sulphate rapidly in the open air and become useless. This is especially true of the negative plate, which hardens in the air and besides losing its porosity, can never be brought back to its former capacity once it was dried while not completely discharged previously.

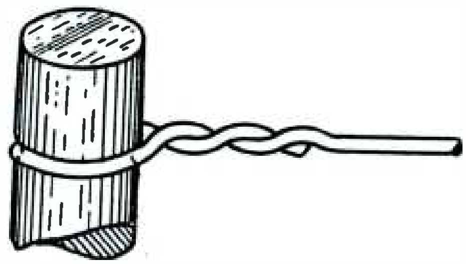
With the Cadmium cell this is vastly different. We do not use a spongy lead plate for the negative, but a "dummy." The simplest experiment is as follows: Take a common storage battery and dis-



M.E. -FIG.2-

charge it completely. Now replace the negative plate with a thin piece of sheet lead and charge the battery in the usual manner. The positive plate will then be charged but the negative will not because of it being not porous. In other words, we have only positive electricity. This is best shown by substituting the negative dummy with another similar dummy.

A voltmeter connected to the cell will barely show any voltage at all. If, however, we take a piece of cadmium metal and immerse it in the electrolyte, taking care that it makes good contact with the dummy, the voltage of the cell will be



M.E. -FIG. 3-

at once about 2.30-2.40. As long as the cadmium remains in the electrolyte, in contact with the dummy, we can discharge the battery in the usual manner. The cadmium, however, dissolves at the rate of 1 lb. for every 500 ampere hours. If we do not wish to use the battery we take out the cadmium. The storage battery cannot discharge now, as the local action between the charged positive and the dummy is practically zero, on account of the lack of porosity of the latter. The cadmium will not disintegrate when removed from the cell and may be replaced at any time desired, in order to discharge the battery.

As soon as the positive plate is discharged, it must of course be recharged again in the usual manner, with the dummy as negative. The cadmium during charge is of course to be removed.

The simplest way to change the ordinary storage battery to the cadmium type is by using one or two positive plates. It is not always practicable to use more than two positive plates, for reasons which will become apparent by following the construction below.

It is self-evident that the cadmium does not increase the capacity, nor amperage of the old cell; only the voltage is increased. A two-plate lead storage battery having usually 20 ampere hours, will only give 20 A. H. when changed to cadmium. If two 20 A. H. positive plates are used with the cadmium, the capacity will be 40 A. H., if a positive plate *is on each side of the dummy carrying the cadmium.*

To construct a good cadmium cell proceed as follows:

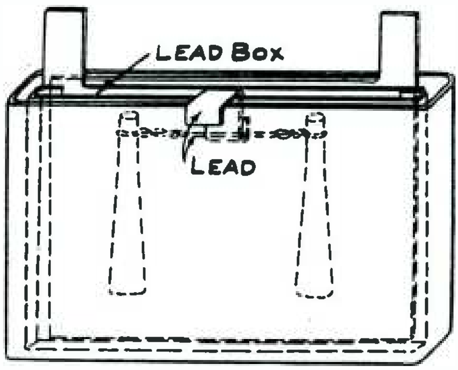
Remove the negative plate from the cell and cut from thin sheet lead 1/16 inch thick a piece as shown in Fig. 1.

It is impossible to give dimensions, as the size changes for every type cell, all depending on the size of same.

The idea is to construct a box-like container which must fit in the storage battery jar without touching the positive plate. In fact, it must be at least 1/8 inch or, better, 1/4 inch away from it. Distance B is the length, C the height and A the width of the lead container. The dotted lines show where the lead is to be folded in order to make the container, as shown in Fig. 2. L is the lug to which afterward a binding post or wire is fastened.

Before the sheet lead is folded the entire surface is to be punched full of holes about 1/16 inch to 1/8 inch in diameter, in order to let the electrolyte circulate freely in the container. A nail may be used to punch the holes and care should be taken that the rough edges of the punched holes come all ***in the inside*** of the completed container.

Cadmium comes usually in form of sticks about 6 to 8 inches long and about 1/4 inch in diameter. It sells at about $3.15 per pound. The width of container (A, Figs. 1 and 2) therefore in most cases is about 1/4 inch. If this



M.E. -FIG. 4-

should be too much, the cadmium may be hammered out flat and the width of container reduced to suit requirements.

The container is next inserted in the cell, and the usual hard rubber separator is placed between the container and the positive plate to safeguard against short circuits. Where there is a positive plate on each side of the container, separators must of course be used on both sides of the container.

The cell is then charged and the lead container treated as if it were the negative plate. After charging the cadmium sticks are placed in the container if the battery is to be discharged.

As it is desirable to remove the cadmium when battery is not in use, the writer adopted the following idea, which proved quite handy and very satisfactory:

As usually two sticks of cadmium are used, a groove is filed around the upper part of the metal sticks, in which a piece of lead (fuse) wire No. 10 is laid and then twisted around (Fig. 3). This safeguards the wire from slipping. The wire should be of lead, as other metals corrode under the action of the electrolyte. The other end of the lead wire is twisted around the other cadmium stick as seen in Fig. 4. A piece of sheet lead is then bent in S shape. The lower part holds the lead wire while the upper one hangs from the edge of container. This enables one to lift out the cadmium rapidly without any trouble whatsoever.

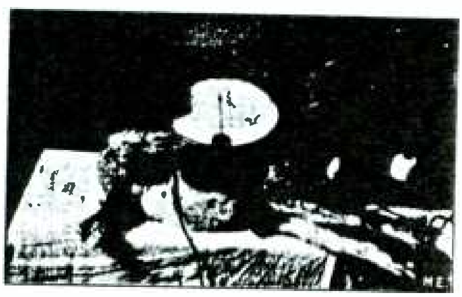
If the battery is left unused, and care is taken that the electrolyte does not evaporate, it is possible to discharge it even after it stood idle for over a year, as soon as the cadmium is inserted.

NEW EXPERIMENTS PRODUCING ELECTRIC SLEEP.

By Frank C. Perkins.

The accompanying illustration shows the latest apparatus of Professor Stephane Leduc and method of application for producing electric sleep.

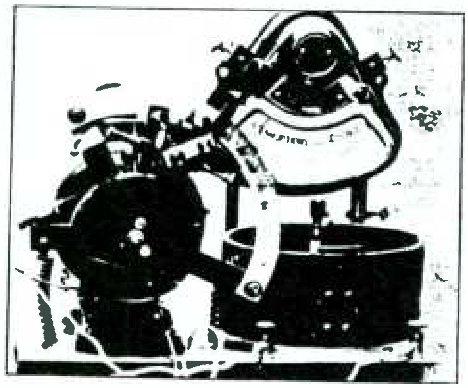
Recent important experiments have



been made on dogs and other animals and the operation producing sleep by electricity has been very successful with human beings.

Electric sleep is produced by using an intermittent electric current. The circuit is interrupted 100 times per second by means of a disc arranged in such a manner that each time it revolves four interruptions are made. An electric motor is utilized for rotation the disc and 100 interruptions per second are therefore produced to 25 revolutions per second.

It is maintained that the human brain is very sensitive to electrical current and as Dr. Erb. Von Liemsen and others have shown, the brain is the most sensitive organ in the human body to electricity.



The experiments in producing electric sleep with rabbits and dogs show that it is absolutely harmless to these animals. It is necessary to produce a current which is very weak at first, the potential being increased little by little until the animal falls asleep under the influence of the current. As soon as the subject is asleep the current is cut off. It is stated that only six volts is required to produce electrical sleep, which may be continued without harm from three to four hours. It is stated that the longest experience was eight hours, produced by Miss Louise Robinowitch. Experiments have been made on Professor Stephane Leduc himself, who was kept under the influence for 20 minutes at two different times. It is stated that Professor Leduc has been able to produce electrical coma or epilepsy by this apparatus for producing electrical sleep.

It is maintained that these experiments are of the greatest value to the medical professor, as it is very desirable that a safe and satisfactory substitute be obtained to replace ether and chloroform for surgical operations.

Loud Talking Telephones

BY OUR BERLIN CORRESPONDENT.

Loud speaking phones, better known under their German name "Lautsprecher" (loudtalker), are coming into extensive use during the past months, especially in large offices, etc.

These phones when used in connection with an especially sensitive microphone transmitter, the so-called "Lauschmicrophon" (whispering transmitter), talk with such surprising strength and clearness that it is possible to understand the words spoken into the far-off transmitter with ease in all parts of a large room.

The new phones embody no new principles, but are all of rather low resistance; 10 to 15 ohms is the usual resistance, which is necessitated, as rather a strong current must be used, to create the great volume of sound.

Especially strong electromagnets, and special diaphragms are used in order to obviate the scratching noises usually experienced with similar phones.

The entire construction of the instruments is made very carefully and the acoustic properties are carried out to such precision that every one who hears the phones talk is invariably astonished on account of the purity and strength of the reproduced voice.

The instrument shown in Fig. 1 is used to a great extent now in factories, stock rooms, cellars, etc., and is mostly used to transmit orders to employees, etc.

Fig. 1

The phone as shown in Fig. 2 is mostly used in offices, especially for dictating letters. It is usually placed alongside the stenographer, who takes down the notes, while the person dictating the letters may be in another part of the building supervising employees at the same time as dictating the mail. The stenographer may also have a sensitive transmitter in order to be able to "talk back." In this instance the party dictating the letters must of course also have a loud talking phone.

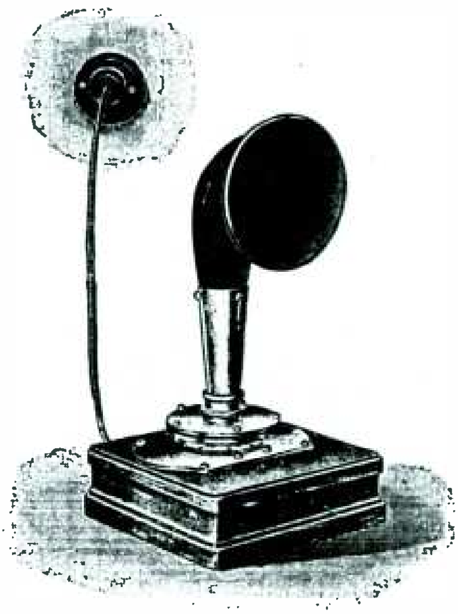


Fig. 2

The instruments are now being perfected to such an extent that by means of a switch they may be switched directly onto the city telephone. This is of highest importance, and it will unquestionably appeal to every American business man who loses considerable time every day by "holding the wire" for long minutes. He does not dare to lay down the receiver, as he could not then hear when the other party was ready to talk. If he could, however, switch on the "loud talker" as soon as he heard "Hold the wire," he could calmly go about his business, as the "loud talker" would call his attention to it in due time.

The new phones sell now from $15 to $30. but it is expected that on account of the great demand for them they can soon be had at a lower figure.

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Vol. II. APRIL 1909. No. 1

EDITORIALS.

With this issue the second year of MODERN ELECTRICS begins.

Once a magazine begins to print "Vol. 2" on its cover, it is safe to say that it is past the experimental stage. During the past twelve months the editor had occasion to thoroughly study the tastes of his readers, and he congratulates himself that during the past three months not a single complaint, as far as the text matter is concerned, has come to his notice. It may therefore be safely assumed that the readers are satisfied with the kind of "brain food" served them monthly.

MODERN ELECTRICS' readers have grown accustomed to expect *real* news, *real* information, and *real* achievement through the columns of their magazine.

While other popular paste-pot-and-scissors magazines enjoy themselves copying each other's articles—usually a rehash of antiquated matter—MODERN ELECTRICS stands out distinctly as a leader now. By perusing competing papers it becomes evident at once that in almost every case, new inventions, new achievements, etc., were published in MODERN ELECTRICS from one to three months ahead of the other periodicals. This is especially the case with European news, which is invariably printed first in MODERN ELECTRICS. Four European correspondents are now regular contributors, their articles being eagerly sought each month. Frequently, if the closing date is near, the news is cabled, if feasible—in short, readers of the magazine know by this time that if it is electric and new, it is published first in MODERN ELECTRICS.

A few figures given below will make the situation clearer:

Total number of articles on wireless printed during the last 12 months, in the following periodicals:

Modern Electrics	115
Electrician & Mechanic	36
Popular Electricity	33

During a period of twelve months 37 articles were published for the first time in MODERN ELECTRICS; these were published later by the following periodicals: *Electrician & Mechanic, Popular Electricity, Popular Mechanics, Scientific American.*

If MODERN ELECTRICS ran ahead of the best magazines in the country, when it was one year old, what will it do during the second year?

It is not surprising that the big dailies such as *The New York Times, The New York World, The Boston Transcript,* and a score of smaller newspapers have grown accustomed to quote from MODERN ELECTRICS when occasion arises "There is a reason!"

Some people have come to think that MODERN ELECTRICS is a purely wireless magazine. This is not so. While it published in the last twelve months more wireless matter than all other popular electrical periodicals *combined*, it will be found that other electrical matter is far from being neglected. The reason of giving so much space to wireless is chiefly because the art being new, more achievements are made than in other electrical branches, and also because the majority of the readers ask for wireless just now.

In conclusion, the old motto of this magazine is brought forward again, as on it the immense success of MODERN ELECTRICS is built, namely: "To print what our readers WANT, not what strikes the editor's fancy."

TO SUPERVISE WIRELESS.

Washington.—Government control of the air, so far as wireless telegraphy is concerned, is not improbable. The agitation for such control is likely to be taken up in the coming Congress and pushed, for the clashes between different wireless stations and the confusion resulting from a commingling of messages have convinced the wireless experts of the Government that some action must be taken. Control of wireless operations is exerted by practically all of the European Governments, but nothing has been done in this direction by the United States. The growth in number and in the importance of the wireless stations established here, and especially along the coast, makes the need of supervision more and more urgent.

A concrete example of the necessity for such supervision was given during the recent blizzard which on inauguration day almost isolated Washington from the outside world. Most of the communication with adjacent cities was by way of a wireless station on top of a leading hotel. This link with the world was sufficient until the powerful Government station in the navy yard here got into action. The instruments were similarly tuned, and the result was that all messages from both stations were rendered unintelligible for several hours.

If there had been a Government rule governing the tuning of instruments, it is contended such a clash would not have been possible.

THE WIRELESS AGE.

Our history is moving on,
Has turned another page
Upon the top of which we note
The words, A Wireless Age.

The farmer's wildest cattle will
Securely graze inside
The new barbed wireless fences which
Some genius will provide.

The fowls, unhampered by the sight
Of firm, unyielding guard,
Most happily will strut within
A chicken-wireless yard.

Our pet canary bird will sing
More sweetly, I'll engage,
And cheerfully will hop about
Within a wireless cage.

Then, in our windows, to debar
Mosquitoes gaunt and lean,
And flies and other insects, too,
We'll have a wireless screen.

And, best of all, we ought to find,
Before this page is full,
That when it comes to pulling wires,
There'll be no wires to pull.

NEW WIRELESS RECORD.

A new record in the transmission of wireless messages from ship to shore was made by the United Wireless Company's operator on board the steamship Northwestern, of the Alaska Steamship Company, when he sent and received replies to several messages between the Northwestern's anchorage in Fitzhugh Sound and the wireless station at Honolulu, 2,500 miles away.

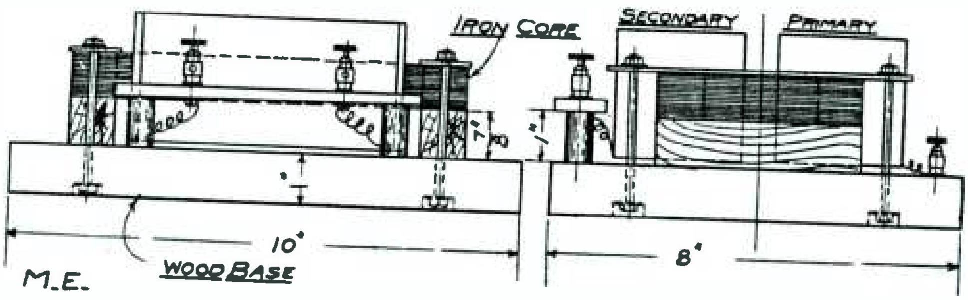
W. A. O. A.

The Wireless Association of America, headed by America's foremost wireless men, has only one purpose: the advancement of "wireless." If you are not a member as yet, do not fail to read the announcement in the January issue. *No fees to be paid.*

Send today for free membership card. Join the Association. It is the most powerful wireless organization in the U. S. It will guard your interest when occasion arises.

250-Watt Closed Core Transformer

By Carleton Haigis.



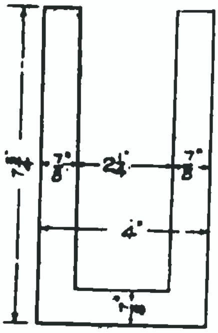
This transformer is designed to operate direct from 100-110 volt alternating current supply and with suitable sending instruments and an 80-foot antenna will send 30 miles overland and a much greater distance over water.

For the core that of an old lighting transformer could be used, but in the absence of that, sheet stove-pipe iron of the dimensions shown at Figs. 1, 2, 3 and 4 is very satisfactory. Enough of each size should be made to make a pile 7/16 inch thick, when pressed tightly together. These are easily cut out with a pair of tinner's shears and the rough edges should be smoothed with a file. Now, beginning with one of the pieces with the longer leg on the bottom place one with a shorter leg on top and continue alternately intermeshing them until you have them all assembled. They should make a pile 7/8 inch thick, and each leg should be 7/8 inch square. The pieces in Figs. 3 and 4 are to be intermeshed between the openings left between the U-shaped pieces at the open end after the coils are in place.

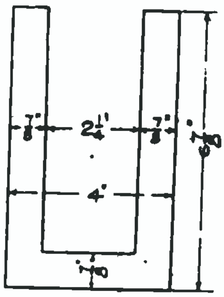
Now we come to the hardest part in the whole construction—that of making the secondary sections. For this purpose a special winder will have to be made as follows: Having obtained a square piece of wood 1x1x8 inches, proceed to cut down the ends to the dimensions shown at Fig. 5, making the mandrel 1/2 inch square at the ends. Now, cut 2 pieces of wood 1/4 inch thick and 2 1/2 inches square and make a 1/2 inch square hole in the center of each. One of these should be screwed permanently to the shank of the mandrel, as in Fig. 5, and the other should be secured in place by a pin passing through it so as to be able to remove the coils after they are wound.

Obtain a quantity of filter paper (such paper may be obtained at any druggists) and from it cut 40 sections 2 1/2 inches square with a hole 1 inch square in center. Each of these sheets should be paraffined with a good quality of paraffine. After they are dry place two of them on the mandrel and secure the movable piece in place. The whole should now be placed in a lathe or other suitable appliance for winding.

Procure 3 pounds of No. 31 single cotton covered copper wire (B. & S. gauge). Since all cotton has considerable moisture in it, the wire should all be dried in an oven the temperature of which should not exceed 100 degrees, as temperatures above this tend to carbonize the insulation. After the wire is dry wind 1,250 turns on the mandrel between the two sheets of paraffined paper. The wire must also pass through a dish of melted paraffine as it passes onto the mandrel. After the section is wound it should be removed, and in this manner 20 such sections should be made. After these are completed paraffine enough filter paper 6 inches wide to cover one leg of the core 1/16 inch deep. This should be placed on the core while still warm, so as to make the paraffine hold it in place. Now, make two ebonite pieces 2 1/2 inches square and 1/8 inch thick, with a 1 inch square hole in center (Fig. 7), and after having placed one on the core proceed to assemble the other secondary section upon it, and after all are in place, the other ebonite piece. Now they should all be connected care being taken that the current will flow through each in the *same direction.* The connections should all be soldered with a non-corrosive soldering fluid and wire solder by means of a small alcohol lamp. The two end terminals should be connected to heavier wires (about No. 18) and tied together temporarily.

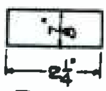


-FIG. 1-



-FIG. 2-

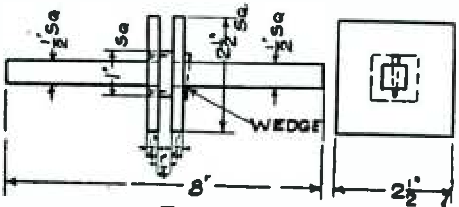
-FIG. 3-



-FIG. 4-

M.E.

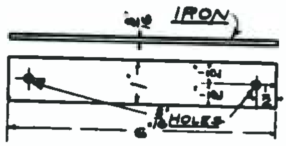
On the other leg of the core wind 100 turns of No. 16 S. C. C. wire, having bound a strip of paper around the core first. These terminals should also be tied together. Now we are ready to place the rest of the core in its place at the open end; these pieces (Figs. 3 and 4) will be found to go into the places left by the longer and shorter legs. After they are all in place a 1/8 inch hole should be bored in the 4 corners and a



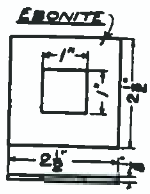
M.E. -FIG. 5-

small bolt inserted. The sections should thus be securely bolted together. All that now remains is to mount the transformer on a suitable baseboard of any hard wood 10x8 inches and 1 inch thick. Make 4 cubical blocks 1 inch on a side and place one of them under each corner of the core. Obtain 2 pieces of iron 3/16 inch thick, 1 inch wide and 6 inches long and bore a 3/16 inch hole 1/2 inch from each end (Fig. 6). One of these should be placed across each end of the core and by means of bolts passing down through the holes into the base secure the whole firmly to the baseboard. Now get a piece of ebonite 1/4 inch thick, 1 inch wide and 6 inches long. Two large binding posts should be placed 1 1/2 inches from each end (Fig. 8) and the whole supported on 2 ebonite rods 1 inch high and 1/2 inch in diameter (Fig. 9), which in turn are fixed to the base. The two secondary terminals are now connected to the two binding posts supported on the ebonite and the primary terminals are also connected to two binding posts which pass directly through the base.

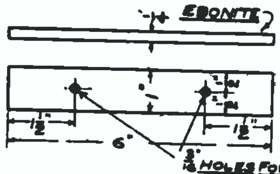
The primary is to be connected in series with an ordinary telegraph key direct to the 100 volt alternating current and should develop a 1/2 inch spark at the secondary terminals. It should never be run with a spark gap of 1/2 inch, as



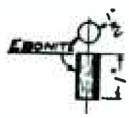
-FIG. 6-



-FIG. 7-



M.E. -FIG. 8-



-FIG. 9-

it might injure the secondary winding. For wireless it should only have a 3/16 inch gap with condensers bridged across it.

WIRELESS ENGINEER WANTED

The United States Civil Service Commission will hold an examination April 21st to secure eligibles for a position as assistant electrical engineer, expert in wireless telegraphy, in the United States Signal Service. The salary will be $1,500 to $1,800 per annum. Information as to the various places of examination are to be obtained from the United States Civil Service Commission, Washington.

A Telephone System

By Spencer Roberts.

The following is a description of a system which has been found entirely satisfactory and which has afforded the owners much convenience, pleasure and instruction.

Any reader who has several friends in his neighborhood will find much pleasure in having a line among them.

The outside wiring is of galvanized iron or aluminum wire (No. 14), which

WIRING OF STATIONS

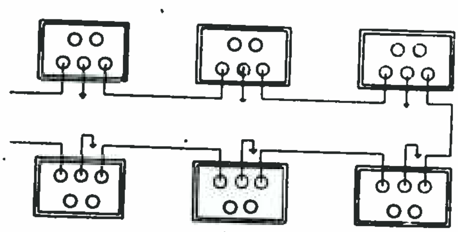


Fig. 1

can be purchased at a small price. One wire is carried from the subscriber at one end of the line to each other subscriber in succession until the other end is reached. A wire is grounded by each subscriber, thus completing the circuit (Fig. 1).

As many phones as desired can be in series; there are seven on the author's line. The wire may be attached at short intervals to trees or houses by means of insulators and brought into each house through a porcelain tube, thereby insuring good insulation throughout. If there are any wires to cross, it is advisable to use covered wire. The inside wiring of each subscriber's station is identical. The instruments can be procured from any supply house. They consist of—

Telephone	$2.00
Polechanging switch (binding posts at back, rubber base)	.80
Union lightning arrester	.65
Three-point switch	.10
Two one-point switches	.15
	$3.70

The pole-changing switch is to reverse the current to conform with that at the station to whom the person is talking.

The three-point switch is to cut down the batteries while talking and to increase while ringing, as the ringing requires more current. The instruments can be mounted upon a board (Fig. 2) and attached to the wall.

Procure a good white pine or spruce board 16x12x1 inches and bevel edges. Then give it three coats of shellac, applying each after the previous one has dried. Then with an auger bore holes for wires so that they are all out of sight and behind the board. The only visible wiring will be where the wires come out to connect with the binding posts of the telephone and pole-changing switch. When this is completed wire according to diagram (Fig. 3). Then screw instruments upon the board. All inside wiring should be of No. 18 annunciator wire. The finished board is ready to be screwed to the wall. Round-headed screws should be used. being about 2 inches in length.

Four new dry cells will be sufficient for each subscriber's telephone. One, two and four is the best way to connect to the

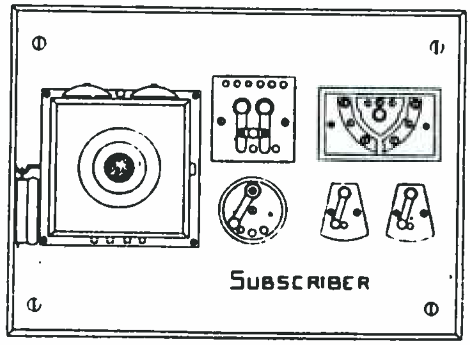


Fig. 2

points of the switch. The wires are led to lightning arrester from the porcelain tube. The two outside wires go to the subscriber on each side and the middle wire is grounded. Wires are led from underneath the board to the batteries. which can be kept in some out-of-sight place. All information can be gained from the diagrams.

The subscribers at each end will have use for only one of the one-point switches but it is advisable to wire in this manner because there might be some new subscriber join the line whose wire will come to the other switch. Before a subscriber goes away from home or during a lightning storm he puts his arrestor plug in the bottom hole and throws off both one-point switches, thereby cutting out his instruments yet not breaking the circuit of the line. By doing this other subscribers are allowed to talk right through his station without ringing his bell.

By using this system no control is required. Each subscriber has his own ring or rings. When a subscriber does not want another subscriber on one side of his line to listen when he is talking to one on the other side, he throws off the switch which controls that side. (Fig. 2.)

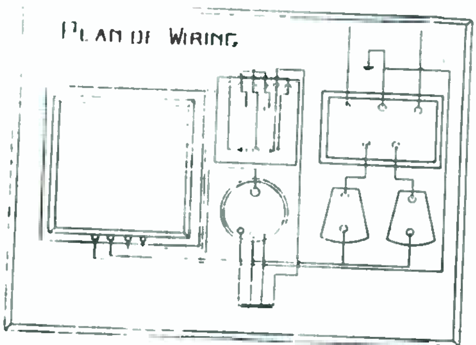


Fig. 3

Those who have wireless stations will find this a handy addition to circulate any news that they might receive.

NEW AMATEUR CODE.

By John N. Mahlmeister.

There has always existed in the minds of those using wireless a desire to use a simpler code than the one now in use, namely, one composed only of dots, as the amateur finds it difficult to master the Morse or Continental codes, and on account of this reason some have either given up experimenting or else they have used a code of their own. The writer has found out from experience that the code shown below is a very simple and easily mastered one, as it contains only dots.

The key to the code is as follows:

COLUMNS

LINES	1	2	3	4	5
1	A	B	C	D	E
2	F	G	H	I	K
3	L	M	N	O	P
4	Q	R	S	T	U
5	V	W	X	Y	Z

Suppose the letter B was to be sent; we find that B is in the first line and in the second column, making B 1—2, so the sender would tick out . .., or 1—2; the letter P is on the third line, fifth column, so P would be 3—5, or ... .

To send the words "come home," the sender would tick out 1—3, 3—4, 3—2, 1—5, 2—3, 3—4, 3—2, 1—5, or . ...

1—3 C, 3—4 O, 3—2 M, 1—5 E, 2—3 H, 3—4 O, 3—2 M, 1—5 E.

A password can also be used in connection with this code, by the use of which only the station knowing the password can understand the message, which would be very useful in time of war.

There could be any number of stations using the code, each station having a different password, and if a message was sent to a certain station using that certain station's password, none of the other stations would understand the message. I will now endeavor to explain the method of using a password in connection with the code.

We will suppose the above "come home" is to be sent with a password (which to illustrate we will say is Arc). We will have to write the numbers of the letters of "come home" on one line and then write the numbers of the password on a second line, adding both lines and then sending the resulting numbers received by adding both, thus:

13	34	32	15	23	34	32	15
11	42	13	11	42	13	11	42
24	76	45	26	65	47	43	57

To decipher a message received with a password it is only necessary to subtract the password (for which any word can be used) and the remainder will be the original message. It will be noticed in the code that the letter J is omitted, which is done to make the code come out evenly and for which the letter I can be used.

It is unnecessary to use a password for ordinary work, as it makes the code complicated, while the code is very simple and easy to learn.

PHILADELPHIA CITY WIRELESS.

The city of Philadelphia will install a wireless plant on the top of the tower of the City Hall, which is more than 500 feet above the street level.

Wireless Department

How to Make a Wireless Control Relay.

By H. W. Secor.

No. 1 = 3 3/4"	16 = 1/8"	31 = 3/8"	46 = 3"
2 = 3 3/16"	17 = 1/2"	32 = 8 7/16"	47 = 8-32 Thrd
3 = 9/16"	18 = 1/2"	33 = 2 1/2"	48 = 1 1/16"
4 = 1"	19 = 1 1/4"	34 = 1/4"	49 = 3/16"
5 = 7/16"	20 = 1 13/16"	35 = 7/16"	50 = 11/16"
6 = 1 1/8"	21 = 1/16"	36 = 7/8"	
7 = 3/8"	22 = 3/32"	37 = 1/2"	
8 = 5/32"	23 = 1/8"	38 = 1 3/4"	
9 = 5/16"	24 = 1/2"	39 = 2 1/8"	
10 = 1 7/16"	25 = 1/8"	40 = 13/16"	
11 = 1/8"	26 = 2"	41 = 1/16"	
12 = 1/32"	27 = 1/2"	42 = 2 1/2"	
13 = 1/8"	28 = 1/4"	43 = 1 1/2"	
14 = 3/8"	29 = 1/2"	44 = 5/32"	
15 = 9/16"	30 = 2 3/4"	45 = 1 13/16"	

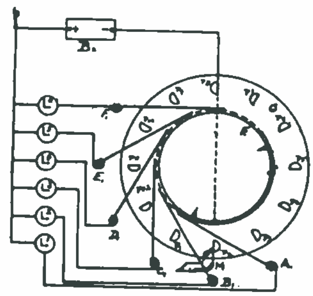


Fig 3

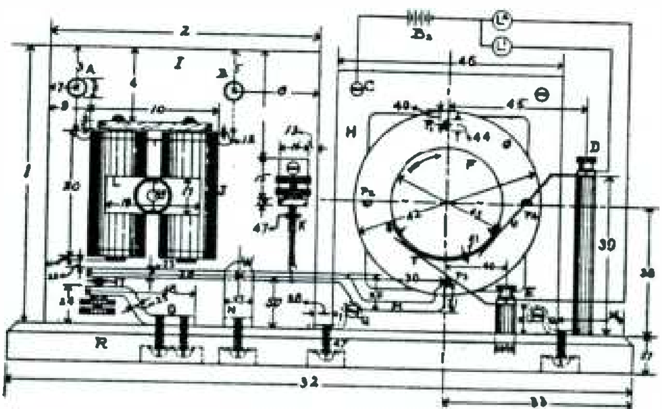


Fig 1

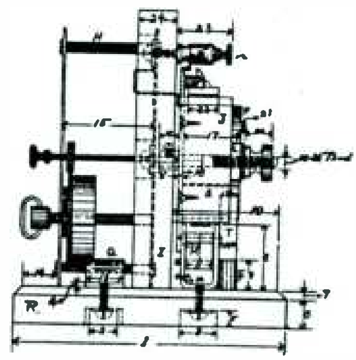


Fig 2

No. 1 = 3 5/8"	9 = 7/16"	17 = 3/4"
2 = 3/8"	10 = 1/4"	18 = 5/16"
3 = 1/2"	11 = 3/8"	19 = 1 3/16"
4 = 1/16"	12 = 1/8"	20 = 3/8"
5 = 1/8"	13 = 1/2"	21 = 1/16"
6 = 3/8"	14 = 3/16"	22 = 3/8"
7 = 1/8"	15 = 1 1/4"	23 = 3/4"
8 = 3/8"	16 = 1/4"	24 = 1/2"

"Selective Relay" for Wireless Telegraphy.

First procure an old clock; an alarm clock will do. Remove the wheels between the hand shaft and balance wheel, so when the clock is wound up the minute hand shaft will rotate rapidly.

Now make a disc of 1/16 inch brass (see G, Fig. 1), having a stud in the center (V, Fig. 2), to fit the minute hand shaft. Four release pins are inserted in the disc (P1, P2, P3, P4, in Fig. 1). They should extend 1/4 inch above the surface of the disc. These pins may be made by threading four pieces of 10-32 brass rod into the disc, soldering them in place and filing flat sides on them as shown.

A small wood cylinder (F, Fig. 1) is now fastened to the brass disc, by wood screws, from the back (see Fig. 2). This cylinder should have a piece of brass (S, Fig. 1) fastened to its surface. The brass is the same length as the wood, and covers about 1/3 of the circumference of it. Where it meets the brass disc it is soldered to it.

Two brass pillars (E and D, Fig. 1) are now made, having two brass springs 1/4 inch wide fastened to their upper ends (see T and U, Fig. 1). The springs are secured by means of the brass nuts threaded onto the pillars. The pillars are fastened to the base by means of two

8-32 screws threaded into them (not shown in Fig.).

The clock frame is fastened to the base by the clamps Q, Q, Figs. 1 and 2. This completes the switching end of the instrument.

The releasing end has now to be made. The first thing required will be an old bell magnet (J, Fig. 1). This is clamped to a vertical wood upright (I, Fig. 1) by means of the 10-24 screw (see Fig. 2) and the fibre piece L, Fig. 1. This makes the magnet adjustable.

The next part is the armature lever (M, Fig. 1), which is made of 1/8 x 3/8 inch wrought iron, bent to the shape shown. A small hole is drilled through it at W, Fig. 1, through which a trunion pin is passed, supported by the trunion block N, Fig. 1.

O, Fig. 1, is a piece of brass bent as shown and fitted with a brass back stop screw, which regulates the play of the lever M. At K, Fig. 1, is placed a right-angle piece of brass, having an adjusting screw threaded through it and attached to the spiral lever spring as shown. This regulates the lever action. To connect the instrument, proceed as follows: Connect the magnet terminals A and B, Fig. 1, to the local circuit of the regular relay. To control two lights, connect lamps L1, L2 and battery B2, as in Fig. 1. Now adjust the instrument so that the lever M intercepts one of the disc pins P1, P2, etc.: this will hold the disc G from rotating. If the lever M catches P1, both lamps are off. If the magnet circuit is now closed for an instant, the lever M will release P1, but the next instant the magnet circuit is opened, and the lever M flies up and intercepts P2. Now No. 1 lamp is on (L1, Fig. 1). Repeating the above operation will release P2 and intercept P3, which puts both lamps on. Releasing P3 and catching P4 turns off L1; releasing P4 and catching P1 turns off L1 and L2. By removing P4 both lights may be turned off together.

To control 1 lamp only (L1, Fig. 1), remove pins P2 and P4. Now, releasing P1 will light L1, and releasing P3 will extinguish it.

Fig. 3 shows the construction and connection of a 12-pin disc, to control consecutively 6 lights. The brass plate S covers about 170 degrees of the periphery of the wood cylinder. If all the 12 pins are used, as shown, when the lever M intercepts P8, Fig. 3, lamp 1 will be turned off. When M intercepts P9, lamps 1 and 2 will be extinguished, etc. After lighting all the 6 lamps, one by one, to extinguish the whole 6 at once, remove disc pins P8, P9, P10, P11, P12. Now, when lever M intercepts P7, all 6 lamps will be on. Release P7 now, and the first pin is P1, which, being intercepted by M, stops the disc, and the lamps are all out.

The 6-lamp disc and cylinder, Fig. 3, should be made larger than the 2-lamp, as the pins would be so close together it would be nearly impossible to operate it. This disc may be used to regulate the speed of motors, besides starting and stopping them. In operating the above instrument, the transmitting key must be depressed and released very quickly, as in sending a fast code dot.

WIRELESS MARCH.

Well, of course. It was inevitable. First the wireless play, then the wireless march! Wireless seems to be in the air.

The title of the new march is "C. Q. D.," words and music by Wilson & Jackson. The music is full of "sparks," "flashy," and "etheric"; the words by no means "shocking." Quite the contrary.

The march is published by the Co-operative Music Pub. Co., Los Angeles, Cal.

NIGHT AIR FULL OF WIRELESS

A. L. Deitz, a young electrical engineer, says the air above Manhattan at night is filled with wireless messages. Mr. Deitz's apparatus is on top of the apartment building, No. 100 West Eighty-sixth street, in which he lives.

"I pick up messages from all sorts of places," he says. "There must be hundreds of experimental stations in New York, and the messages are going through the air all night long. My apparatus has a radius of seventy-five miles."

French Wireless Telegraph and Aerophone Devices

The Popoff-Ducretet wireless telegraph and aerophone, as shown in the accompanying illustrations, have been used extensively by the Russian Government at their land stations as well as on board their men-of-war. On the Mediterranean Sea, ships have communicated with

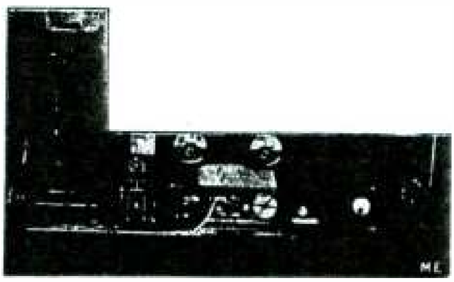


Fig. 1

each other at distances of nearly 150 miles, and on the Black Sea, two shore stations have communicated with each other over land and sea at a distance of 200 miles.

The transformer with two periodic interruptors may be noted at the left as well as the motor and vertical interruptor, also the Wehnelt electrolytic interruptor. The oscillator is connected with the coil and the terminals are connected with the antenna for the transmission of the Hertzian waves into space. At the right may be seen the relay receiver, recorder and radio-conductor as well as the radio-telephone.

In the course of recent experiments last October distinct radiotelegrams were transmitted two miles with perfect clearness without the use of antenna, the receiving apparatus being placed on a table without any exterior communication. Messages were also sent with the antenna at the latter station fixed on the level of the roof, the height of the same being 72 feet from the ground. Notwithstanding the moderate height of the antenna, radiotelegrams were received 27 miles away, showing the great sensitivity of the Popoff-Ducretet receiving apparatus. The Morse recording apparatus of the automatic type is used and with single masts 175 to 200 feet in height, the distances have been greatly increased. The portable apparatus provided is said to have given excellent service on land as well as sea over great distances. Communication can be established from vessel to vessel over 120 miles and between shore and vessel 150 miles, these distances being surpassed with special antenna and apparatus available.

The drawing, Fig. 2, shows the military type of interruptor connected with a Rhumkorff coil having a sparking length of about eight inches. In certain cases it is necessary to have a very great number of interruptions per minute, and this is obtained by the rotary interruptor noted in the illustration. An electric motor with speed regulator places the interruptor in operation plunging same into receptacle containing mercury covered with petroleum, giving 3,200 contacts per minute with a motor speed of 800 revolutions per minute.

At Paris there are 15 clocks connected with the Observatory of Paris by electrical conductors, the clocks being located in different sections of the city, for providing the correct time. A master clock

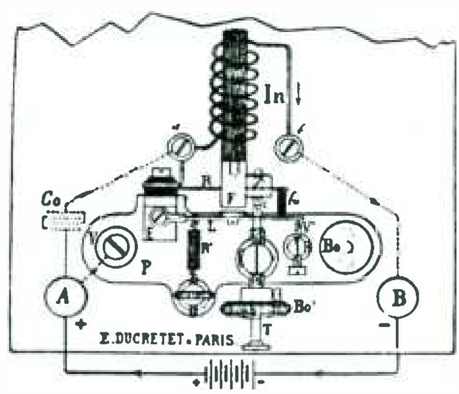


Fig. 2

makes the necessary corrections electrically and many villages have installed this apparatus, the correct time being sent from the Observatory of Paris. In Washington the exact time is sent daily throughout the United States by means of the present telegraphic system. It is claimed that M. C. Bigourdan has made interesting experiments on the transmission of time to a distance, using the Ducretet wireless telegraph apparatus.

(Continued on Page 26)

How To Make a Revolving Condenser

BY A. WARD.

The writer having had some trouble in receiving with his station, suspected the cause to be in condenser not being of sufficient capacity, constructed the one described here, and as soon as it was connected signals were received much stronger and clearer.

To construct it, first procure a piece of wood 8 inches square and 3/8 inch thick and screw some strips of wood 7/8 inch by 5/8 inch around it so as to form a box 7/8 inch deep and 6 3/4 inches square inside, as shown in Fig. 1.

Now procure some 22 gauge sheet aluminum and cut four pieces like Fig. 3. These are to be piled up on baseboard or bottom of box, as shown in side view, Fig. 3 (in which sides of box are removed), and separated by collars 3/16 thick cut off 7/16 brass rod. They are held in place by two 8/32 brass screws,

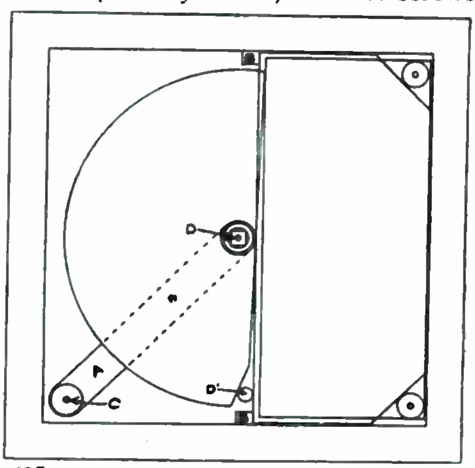


Fig. 1

which are countersunk in base. The top collars are 1/8 inch thick and tapped to fit screws. One screw is left projecting to receive a binding post.

Next cut 7 pieces of glass out of old 5x7 negatives of the size and shape shown in Fig. 4. Six of these are to be cemented together in pairs with strips of 1/32 inch hard rubber 1/4 inch wide between them at each end, as shown in side view, Fig. 4. A little thick shellac on rubber strips and heat over a lamp to expel all moisture will hold them firmly. These are to be slipped between aluminum plates in Fig. 3 and are for the revolving plates to slide in between. The remaining glass is laid on top and all are held in place by two blocks (B, Fig. 1) 1/4 inch by 3/16 inch and 7/8 inch long tacked inside the box.

Now, cut out 4 pieces of the sheet aluminum like Fig. 5 for the revolving

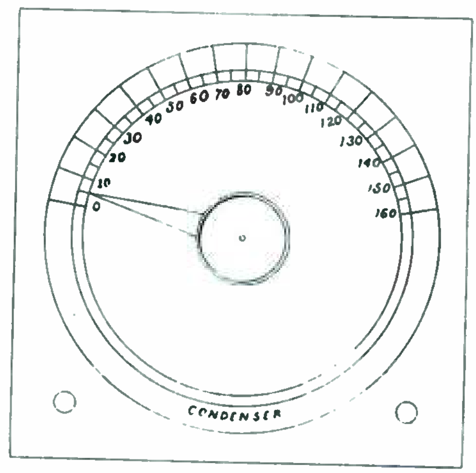


Fig. 2

plates. These are to be put on an arbor made of 1/4 inch square brass rods (Fig. 6). The ends are turned down and threaded with a 10x32 die leaving the square part 11/16 inch long. The collar A is 1/16 thick and 1/2 inch diameter, and is screwed and sweated on. The projecting stem is then turned down to size of No. 20 drill. The top collar is to journal arbor in top plate. C is cut off 5/8 brass rod 3/16 inch thick and turned down to 1/2 inch diameter. 1/8 inch of its thickness with a 3/8

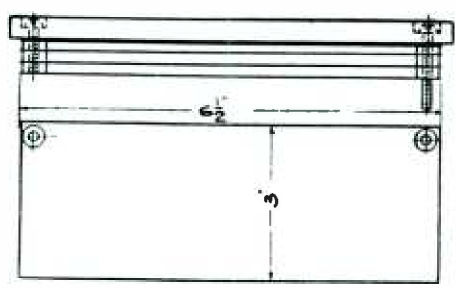
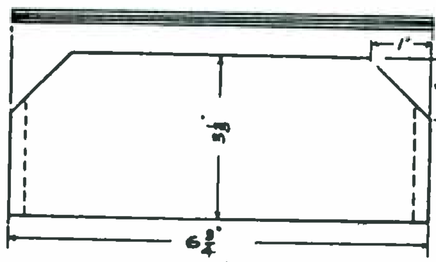


FIG. 3

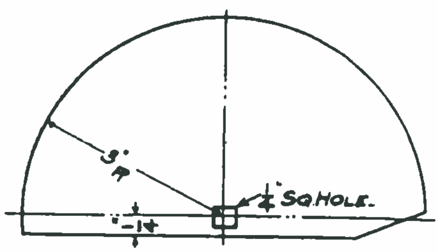
inch hole. Over this slip a washer C 1/32 thick, which goes on top of plate and under it the indicator hand (Fig. 7).

Hand is cut out of 16 gauge sheet aluminum. A hole is drilled at D to receive stop pin D, Figs. 1 and 6. A knurled thumb nut (Fig. 8) screws on top of this. Also make 3 collars to separate



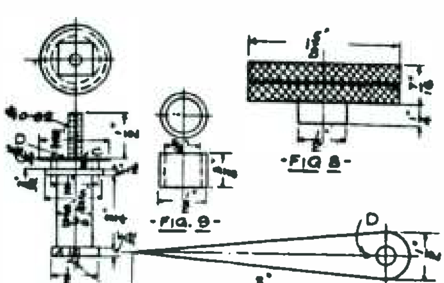
M.E. -FIG. 4.-

aluminum plates on arbor 1/2 inch diameter 3/16 thick with a 3/8 inch hole in them. Cut out a strip of 16 gauge brass 1/2 inch wide and 5 inches long and drill a No. 20 hole in each end and a hole about the center to receive a 3/8-4 flat-head wood screw. This is screwed



M.E. -FIG. 5-

in bottom of box A, Fig. 1, and serves as lower journal of arbor and to connect revolving plates with other binding post. An 8/32 brass screw 1 3/8 inches long extends up through bottom of box at C for this purpose, and has a sleeve slipped



-FIG. 6.- -FIG. 7- M.E.

over it, cut off 7/16 brass rod 7/8 inch long. A wooden peg D1 1/4 inch diameter is driven in a hole drilled in bottom of box to act as a stop pin to prevent revolving plates being turned out of glass plates when turned to zero.

The cover of box is a piece of 3/32 hard rubber 8 inches square. A dial is scratched in with dividers as shown in Fig. 2, and a little Chinese white rubbed in the scratched circles. The circles are 5inches, 5 3/8 inches and 6 inches in diameter. They are divided in spaces of 5 degrees, starting and ending 10 degrees from the horizontal. The cover is then screwed on with round-head brass wood screws 3/8-4. Place indicator hand on and screw knurled head (Fig. 8) on tight, also two binding posts, and the condenser is complete.

MAJORANA AEROPHONE

(Continued from Page 5)

graph station at Rome. The Marine Department had a second station for the aerophone experiments erected at Porto d'Anzio, which used a 150-foot four-wire antenna, at 35 miles distance. In the Rome station the four-wire mast is about 280 feet high. Speech could be heard very well at this distance. Then it was desired to work on a larger scale, and the Marine Department placed the torpedo destroyer Lanciere at the disposition of the inventor. The vessel proceeded to the island of Ponza, lying at 75 miles from Rome, where there was located a wireless post belonging to the Government having a four-wire antenna about 200 feet high. After fitting out the post with the new apparatus, it was found that the resuls were even better than in the latter case.

The Lanciere was then taken to Maddalena, in the island of Sardinia, and the apparatus was placed in a wireless post lying near this port, the station being like the one just mentioned which is located at Ponza. The distance from Rome in a straight line is about 170 miles. However, this last point is surrounded by mountains, so that it is not well placed. This limit only refers, however, to the size of the antenna at Rome and the power which is used there (about 3.5 amperes), and is not by any means the farthest distance which can be reached. Seeing that the hydraulic microphone gives excellent results, there is nothing to prevent us from covering much greater distances by increasing the power of the apparatus at the sending station.

The Aerophore Automatic Signaling Device

By Rene Homer.

One of the earliest discoveries bearing upon the generation of Hertzian waves was that the waves were much stronger between a diagonal antenna and the ground than above it. The waves thus radiated go much further, therefore, in the direction of the slanting wire, so that an inclined wire attached to a boom extending from a mast will radiate a distance proportionate to the proximity of the waves to the line of the boom. Several other methods have been successfully employed to give a definite direction to Hertzian waves. The method employed by Bellini and Tosi is, perhaps, the latest. This theory was employed even by Bell in his photophone, which sent the Hertzian waves along a beam of light. This principle of the projection of these waves in a given direction forms the basis of Dr. De Forest's wonderful aerophore.

In accordance with this principle of linear projection of ether waves, lighthouses can send out an electrical impulse detectable by any properly equipped boat which comes within range. This wave can be constantly changed in its direction by revolving the projecting apparatus, so that any boat which receives the signal can tell its direction from a dangerous spot equipped with the aerophore, when this device is equipped to transmit intelligible signals differing automatically with the constantly changing direction of the projected waves. Thus, when the waves are thrown in a northerly direction, a certain telegraphic or telephonic signal is automatically transmitted to any receiver which crosses the line of projection. When the wave is thrown in an eastern direction, this signal, of course, will be different.

This same principle is applicable to an equipment for vessels, which will prevent collisions. Two approaching vessels sending out ahead intelligible signals cannot come within dangerous proximity without at least one of the vessels being warned of its danger, thus enabling pilots to determine their position and respective courses by a wireless telephone conversation.

The type of aerophore device upon which Dr. De Forest is experimenting at present, consists of an apparatus which causes a boom to revolve about a mast. This movement is stopped momentarily at the points of the compass, while a phonograph announces over the wireless telephone the direction the wave is thrown. In connection with this apparatus is a set of bells tuned to the quarters of the octave, which are constantly struck, one after the other, several times a minute. Each of these bells sounds into a microphone transmitter, and is sent over the wireless telephone with varying range of penetration; thus, when a boat hears the entire four bells, it is obviously within range of the fourth bell, a distance which has been already calculated, and is charted beside the instrument. When only three bells are heard the boat must, of course, be outside the range of the fourth bell, and so on. This process enables the navigator to determine within a very close distance just how far he is from the point of danger.

At first the difficulty encountered was the fact that when the instrument was sending over a single antenna, it was impossible to receive, so that a vessel might possibly miss the signals of another aerophore, simply because it was sending at the same time as the other instrument. With the advent of De Forest's new multiplex sending and receiving system, it becomes possible to both send and receive over the same antenna at once. Thus, in actual practice, every receiving machine would be tuned to a certain point, while each of the sending mechanisms would have a "common tune," which would differ widely from that of the receiving part of the apparatus. Each machine has a pilot lamp, which is made to glow by induction whenever the apparatus receives a signal, so that the vessel is safe as long as the lamp does not light. The same mechanism which lights the lamp can also be made to operate a buzzer, which calls the operator to the instrument. Whenever the lamp glows, or the buzzer sounds, the operator places the head phones to his ears until he makes out the name and distance of the communicating station. If the call comes from another vessel, he uses the telephone to determine its course.

The aerophore will be placed in operation some time during the coming season by the Great Lakes Radio Telephone Company, in conjunction with the wireless telephone. This company has already completed its stations at Chicago, Milwaukee, Toledo and Cleveland, while stations at nearly twenty other places are in progress.

Many steamship owners have contracted for the installation of the telephone, and after the wireless telephone has been put into successful operation, the installation of the aerophore will be commenced. Aerophore stations will be erected at all of the principle points of danger. The first stations to be thus equipped will be those at the Straits of Mackinac, Outer Island, Island Royal, Sault Ste. Marie and Georgian Bay. These stations will be followed rapidly by installations in all of the towers of the Atlantic Radio Company along the South Atlantic Coast, and later upon the North Atlantic and the Pacific coasts. The United States Navy is deeply interested in De Forest's devices, and the Hydrographic Office has asked for an appropriation to demonstrate the utility of the invention upon the Great Lakes.

An apparatus along similar lines is being constructed now for a thorough trial upon several Western railroads, and should prove very effective in preventing collisions and similar accidents.

In Fig. 1, J represents a prime mover of any suitable type which, by any convenient means, such as the belt 14 passing around the pulleys, 13, 13′, may drive the generator G. M represents a transformer interposed between said generator and the spark-gap S, and C is a condenser which may be connected across the terminals of said spark-gap. In Fig. 1, the prime mover J rotates the signal wheel Q by means of the shafts 2, 3 and any appropriate gearing, and intermittently rotates the reflector H by means of similar shafts 2′, 3′ and gearing, although any suitable means may be employed to communicate motion from the motor J to the wheel Q and reflector H. The secondary of the transformer M is connected to the antenna A by means of the brushes 4. 4, and rings 5. 5. Geared to a pinion 12′ which is operatively connected to the motor J, is a wheel 12 which operates the crank arm 10 connected to the switch 5 by means of the rod 9 which reciprocates in the guideways 11, 11, and so communicates an intermittent movement to

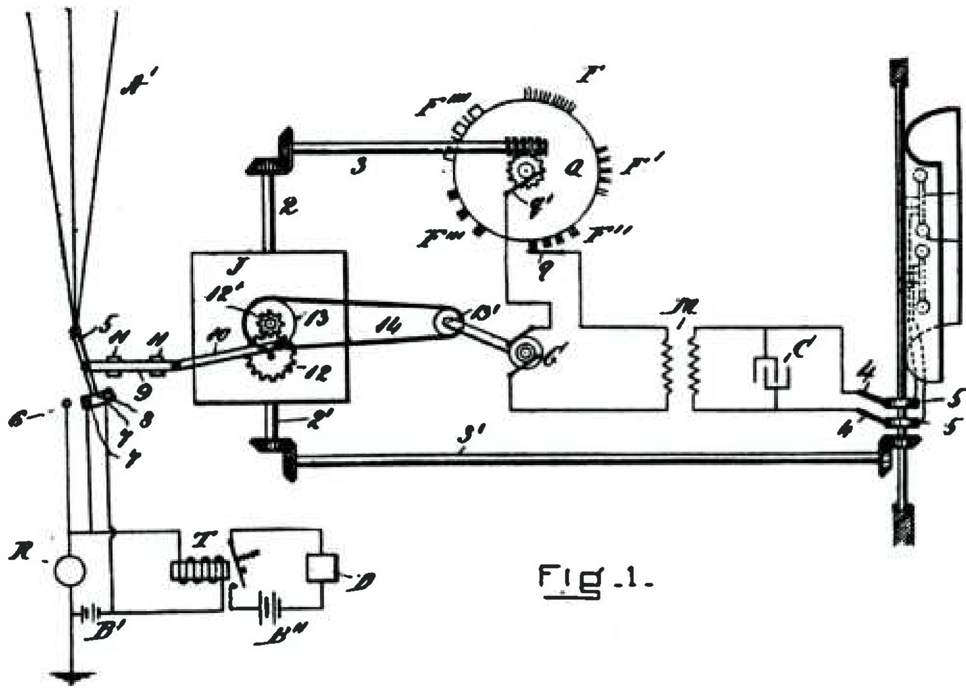


Fig. 1.

said switch. When the generator circuit is closed through any of the contacts F. F', etc., of the signal wheel Q, the switch 5 is in such position that its contact 8 co-operates with the contacts 7, 7, thereby connecting a shunt circuit around the responder R and at the same time breaking the connection of the receiving antenna A' with said responder R at the point 6, so as to protect said responder from the effects of the transmitted waves.

The mechanism which operates the reflector is connected and arranged in any suitable manner to rotate said reflector through an arc of, say, 225 degrees, and back again. The signal wheel is rotated continuously and its signaling contacts are so arranged with respect to the position of the reflector H that when the reflector is directed so as to concentrate the radiated waves in a particular predetermined direction, a distinctive signal is produced. Thus, for example, when the reflector is directed to the starboard, a signal consisting of a series of dots is emitted; when it is directed to the starboard-quarter, a series of two-dot signals is emitted; when the reflector points to the bow, the signal consists of a series of three dots; when it points to the port-quarter, the signal consists of four dots; and when it is directed to the port, a signal dot-dash signal is produced.

The circumference of the signal wheel Q is divided as shown into ten parts, although it may be divided into any other number of parts, and a certain number of said parts, herein shown as five, are provided with the signaling contacts F F', etc., while the remaining parts are left blank. When the reflector H is directed as above indicated, the circuit of the generator is closed through the brush *q*, one set of the contacts F, the wheel Q and the brush *q'*, and when the circuit of said generator is broken by a set of the contacts F breaking connection with the brush *q*, the switch 5 is in such position that the shunt around the responder R is broken at the contacts 7, 7 and the antenna A' is connected to earth E by way of said responder at the point 6. In such position of the apparatus, any signal which may be emitted by an aerophore on another ship may be received by the responder R and thereby energize the magnet T, connected in series with said responder and the battery B'. This magnet T may be a telephone magnet, or as shown, it may be the magnet of a relay which, when energized, will close the circuit of the signal-indicating device D and the battery B". The signal-indicating device D may be a bell or an incandescent lamp or any other device which will give an audible or visible signal. The pilot of a vessel receiving such signal by referring to a table or chart can determine the position of his ship with respect to the ship from which the signal was transmitted. For example, in the diagram shown in Fig. 2, the ship K' which is on the starboard side of the ship K would receive the standard signal indicating "starboard," which, as above set forth, might be a series of single dots, but would not receive the signals indicating starboard

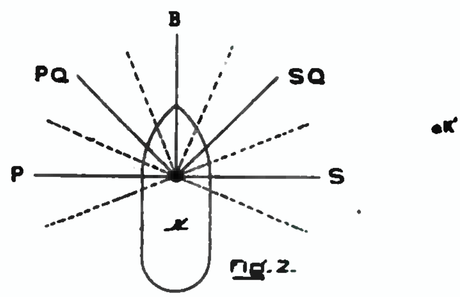


Fig. 2.

quarter, bow, etc.; while if a vessel were ahead of the ship K its pilot would receive the standard signal indicating "bow," but would not receive the others.

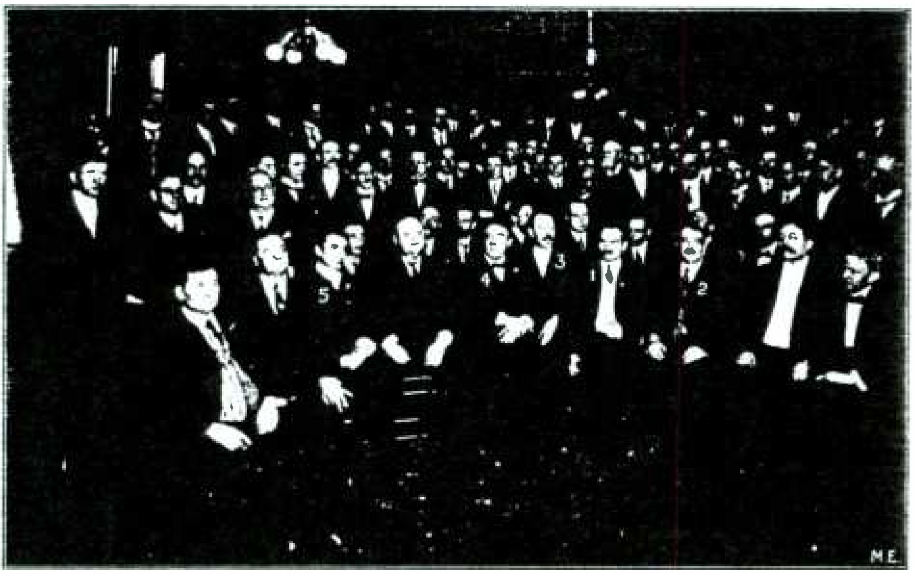
THE SENSITIVITY OF THE TELEPHONE.

It is truly marvelous how sensitive an ordinary telephone receiver is. Preece calculates that a sound is produced in a telephone by a current equal to .000,000,000,000,6 (six ten trillionths) of an ampere in intensity, or such a current as could deposit about .000,000,000,000,03 (three hundred trillionth) of a cubic inch of pure copper in each second of time.

Pellatt calculates that with a voltage of .0005, representing the difference in potential, between the two terminals an audible sound is maintained in the receiver. In other words, it would take 10,000 years for such a force to raise one gram of distilled water from zero centigrade, to one degree above.

Above values may be multiplied 10 to 25 times if the instrument is a modern wireless telephone receiver.

Wireless Banquet



1.—Dr. Lee de Forest. 2.—James D Smith. 3.—E. E. Burlingame. 4.—Captain J. E. Darby. 5.—H. Gernsback.

At a banquet given February 13th last, in the historic Fraunce's Tavern, New York, in honor to Dr. Lee De Forest's work in aerophony, and on account of the successful financing of the Great Lakes Radio Telephone Co., the inventor, Dr. De Forest, spoke of his achievements. He stated that with his new sparkless wireless (undamped, such as used with his aerophone) the possibility of interference is reduced enormously, as much sharper tuning may be achieved. This, as is well known, is a very difficult thing to-day with spark wireless.

Dr. De Forest also spoke of his early work and stated that with his new aerophone system a much greater amount of despatches can be handled in a much shorter amount of time than with the present wireless telegraph.

Mr. E. E. Burlingame was toast-master and complimented the inventor on his work. Mr. Smith, the president of the company, announced plans for the immediate erection of a chain of wireless stations along the Atlantic and Pacific coasts, as well as at certain points in the interior.

Mr. H. Gernsback spoke of the achievement of amateur wireless telegraphy in the United States, and demonstrated that the young experimenters have done a great deal to further the new art. He also spoke of the Wireless Association of America, which he founded, and of which Dr. De Forest is president. Mr. Gernsback closed with a fantastic account entitled "Wireless on Mars," which created universal applause.

Over 100 wireless men attended the banquet.

NEW ENGLAND WIRELESS SOCIETY.

This society was incorporated under the statutes of the Commonwealth of Massachusetts on February 4th for the study and improvement of wireless communication. The regular meeting is to be held the first Friday in each month. Mr. Gordon S. Wallace, 563 Massachusetts avenue, Boston, is acting secretary.

FRENCH STUDY WIRELESS.

Paris.—The French Government, as a result of the use made of wireless telegraphy following the sinking of the steamer Republic off Nantucket January 23, is studying the entire question of wireless communication.

The idea in view is to introduce a bill to oblige French navigation companies to install wireless apparatus on all their ships above a certain tonnage.

Condenser Phenomena

By C. C. Whittaker.

The most common condenser is that of the plate form, which is a descendant of the original and classical condenser, the Leyden jar. Whatever the form may be, the parts are essentially the same; they are conducting plates separated by an insulating plate called the dielectric.

Before proceding farther it will perhaps not be out of place to present a few definitions of terms used in connection with condensers.

A unit "capacity" is the capacity of a conductor which contains a unit charge of electricity at unit potential. Using practical units, this means that a condenser whose potential is raised one volt by a current of one ampere flowing into it for one second has "unit capacity" or one "farad" capacity. This unit is much too large for practical work, so the microfarad is used. This is one one-millionth part of a farad.

A condenser is said to be charged when the alternate plates have the opposite kinds of electrification. It is discharged when the two opposite charges are allowed to unite.

With these definitions in mind we shall proceed to the discussion of some of the more important features of the action of the condenser.

In general the discharge of a condenser is oscillatory. In Fig. 1 let A and B be two condensers, the lower plates of which are connected to the ball E and to the earth. If F and G are connected by some conductor of low resistance, such as a heavy wire, and the whole system charged by bringing a charge to C until a spark passes at D—E, both condensers will be discharged at the same time. This is, however, quite different when F and G are connected by a conductor of high resistance such as a wet string. Now, if C is charged until a spark passes between D and E, we shall find that there will be a spark at F—G which is much longer than that at D—E. The following is the explanation:

The time of charging was relatively long compared to that of discharge. Therefore the current had plenty of time to overcome the high resistance at F—G and to charge A with the same quantity as that of B. Now, when the discharge takes place the charge from A cannot overcome the resistance at F—G in the time of the discharge at D—E. But as the two plates of condenser B are connected by a good conductor, the charge on the upper plate, assuming it to be charged positively, overruns itself, as it were, to neutralize the negative charge on the lower plate. Now, if the potential difference between F and G was the same as that between D and E, the spark length would be the same. But the length between F and G was observed to be greater than that between D and E. This shows that the potential of the top plate of B must have been less than zero. Since this is so, the potential of the lower plate, which was always zero since it was connected to the earth, must

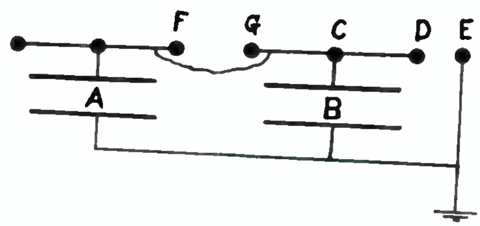


Fig. 1

now be greater than the top plate. Consequently the direction of the flow will be reversed. This process is repeated many times in the small fraction of a second, the actual time being 1/20,000 part of a second.

It is now evident that the discharge is oscillatory only when the plates are discharged through low resistance conductors; if discharged through conductors of high resistance, the potential gradually, so to speak, falls to zero and remains there.

The oscillatory discharge may be easily shown by the use of an induction coil. If an exhausted tube is connected to the terminals of an induction coil in operation, one terminal is seen to glow more brightly than the other. This bright one is the cathode, or negative terminal. If a condenser is placed in the circuit in parallel with the tube it will be seen that the latter glows with equal radiance at both electrodes. This can be readily accounted for by the oscillatory action of the condenser.

We shall next turn our attention to the capacity of a condenser. This may be readily calculated by the aid of the formula, $C = \frac{K\ S}{4\ \pi\ D}$ where K equals the dielectric constant, S equals the total area of the conducting plates, π equals the mathematical constant 3.14159, and D equals the thickness of the dielectric. (The metric system must be used for S and D.)

This formula gives the capacity in C.

Fig. 2

G. S. (centimeter, gram and second) units. The practical working unit, the microfarad, is 1/1,000,000,000,000,000 part of the C. G. S. unit.

The following is a partial list of the values of the dielectric constant:

Air	1.
Paper	1.9
Paraffine	2.
Ebonite	2.5
Shellac	3.5
Plate glass	6.5
Mica	6.6

Condensers may be arranged in series, parallel or any combination of these arrangements.

When arranged in series, the capacity is decreased. For, in Fig. 2, the effect is the same as one condenser with the

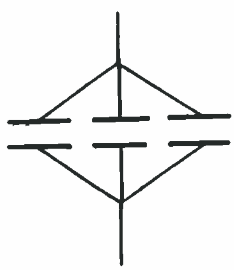


Fig 3.

dielectric three times as great in thickness. Thus in the series arrangement the capacity is lowered and resistance is added to the circuit.

The effect is quite different, however, when condensers are connected in parallel.

In Fig. 3, if the capacity of each condenser is equal to x, then the capacity of the system equals 3x, for the only variable is the area of the active plates and this varies as the number of condensers.

Therefore the total capacity of a system of condensers coupled in parallel is equal to the sum of the separate capacities.

NOISY AERIALS.

Very few people know that large aerials actually produce sound when a message is sent over them.

This is actually the case, and it can be observed very well, especially on ship aerials. However, nothing can be heard unless the power used is at least 1 K. W.

When one stands directly under a ship aerial, and far enough away from the sending station, so that one does not actually hear the spark from the gap, and when a message is being sent, a low crackling noise can easily be made out. In fact, every dot and dash can be heard quite well and the message can be actually read by sound by an operator.

The explanation is that there is a certain amount of leakage from the wires into the salty air, which is a fairly good conductor.

If there is a dense fog, or when the air is very moist during the night, a luminous discharge can be seen all along the wires on a ship aerial; frequently in fact every inch of the entire aerial may be outlined, due to the glow discharge.

"FIPS" PROTESTS.

There are some people who always do the wrong thing at the wrong time. I am talking of the boss.

Did you see the new cover this month? Do you remember that I told the boss last fall that the lady on the old cover needed a warmer dress? Do you also remember that he almost made pulp out of my anatomy when I told him about it? And what does he do now? He goes and puts a dress (?) on the lady, *just when it gets nice and warm,* and when she doesn't need it at all! It's needless to say that the other lady—poor girl—died of consumption last month on account of "exposure," just as I predicted. Another case of covering the well after the elephant had fallen in it.

I would furthermore suggest to supply the new gentleman on the cover with a coat, at least up to June first. He looks kind o' chilly just now.—"Fips."

Wireless Telegraph Contest

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three ($3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or a laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

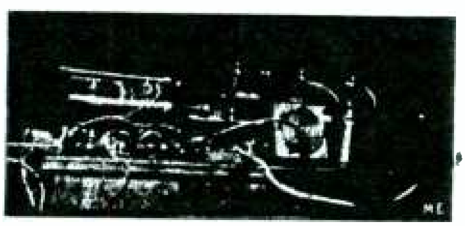
This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE, THREE DOLLARS

I have of late completed a wireless telegraph set and I thought that readers of MODERN ELECTRICS may like to read about it.

Sending Station.—The spark coil used gives a 6-inch spark and may be seen to the right of picture on the farther side of the table. The sending helix is standing in front of the spark coil. The condenser used in connection with the helix is a common 1-quart Leyden jar. The telegraph key is a heavy model of the common type, on the left of the helix. I use three cells, type R. E., for sending, not shown in picture.

Receiving Station.—The large tuning coil may be seen to the extreme left of the picture. In front of it and just behind the telegraph receiver is an electrolytic detector, not plainly shown in the picture. To the right of the receiver is a potentiometer, and to the right of it is a common dry cell used for receiving only. Between the dry cell and the telegraph key, but not plain in the picture,



is my aerial switch, from which can plainly be seen the ground wire. This completes my set, which, though simple, is very sensitive and satisfactory.

EDWIN R. WILLARD.

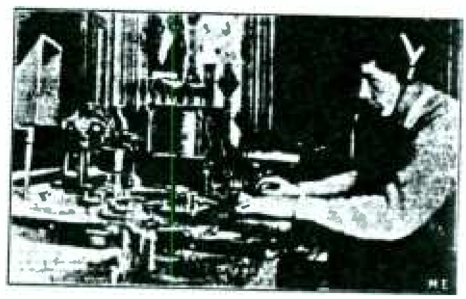
Chicago, Ill.

HONORABLE MENTION.

Enclosed herewith find a photograph of my wireless telegraph station. The antenna I use is two hundred feet long and fifty feet high at both ends.

In my transmitting set I use a 1 1/2 inch spark coil. Two condensers made of lamp chimneys and a sending helix made like a transformer. I run the spark through transformer, which steps the potential of the current up. The terminals of the secondary of the transformer lead to the antenna and the earth, thus forming an open circuit oscillator.

My receiving set consists of four detectors, carborundum silicon, pericon and electrolytic which are all mounted on a hard rubber base. I use a tuning coil with a secondary on one end of it. A variable condenser helps me greatly to tune, as it keeps me from having to move the slide on the primary of the tuning coil. The telephone receivers are



wound to a resistance of two thousand ohms.

With this set of instruments which I constructed I can send about ten miles. But on the other hand I can receive from Pensacola, Fla., and Cape Cod very easily. Most of the navy stations on the Atlantic Coast I can pick up with little trouble by careful tuning. All of these stations have long wave lengths and are easy to tune to.

Many of the merchant ships and coasters have wireless on them. These ships all have short wave lengths. They may be picked up at night, but it takes a fine operator to read them, as they don't lose any time in sending out their messages.

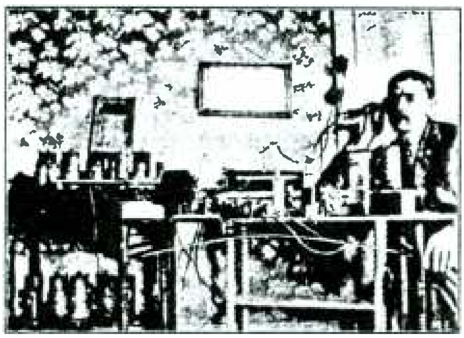
I have been taking your magazine since November and have gathered much wireless news from it.

W. R. BURDETT.

Washington, D. C.

HONORABLE MENTION.

Enclosed find photograph of my wireless apparatus, which is home-made except the receivers. The switches and fuse plugs do not show, as I have the whole apparatus in a large closet when working, but had to remove them to be able to take the photo on account of it being dark in closet. On farther end of table from me are some of the batteries, in front of which is a small motor which I built, also a potentiometer made of German silver wire. Next comes a small magneto which I made from old files and block gears; then my tuning coils made of bare copper wire No. 22, with strand of thread wound between. I have



about one pound of wire on same. In front of magneto you will see a galvanometer.

A 1/2 inch coil with spark balls may be seen, also my detector, which is of the electrolytic kind; it is partly hidden behind a standard, on which you will see a spool; this piece of apparatus has a sounder and tape attachment worked by a block arrangement that records the dots and dashes so I need not be at the receiver to know if same is working. This piece of apparatus I consider my best piece of work, as it works quite well. The frame on the wall contains the stations in the United States. The magazine on the batteries tells its own story, to which I owe a great deal for the success of my plant. My aerial wires are 4 strands, 50 feet long, 18 inches apart, 45 feet high, No. 16 bare copper wire. Leading in wire is No. 12 rubber covered wire. Ground wire, No. 12, connected to water pipe. I have a magnet arranged on my camera with a flexible cord and push, which I worked with my foot to take the picture.

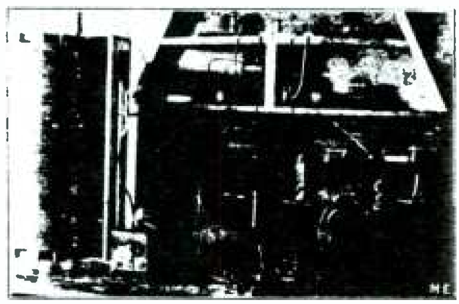
New Jersey. GEO. H. NIXON.

HONORABLE MENTION.

My wireless consists of a sending and rèceiving set. My sending set consists of a spark coil, which you see in the center of the picture; my tuning coil to the right in the picture, which I made myself; also condenser. Receiving set consists of tuning coils, shown at left of picture; variable condenser, shown behind the coil. My spark coil, to the right of that, has zinc spark gap, which I made myself. The variable condenser has eight plates, 3 1/4 inches by 4 1/4 inches.

The last part of the receiving set is the filings coherer and relay, which is seen in the lower part of the box-like place; two choke coils and a small motor. In the top box is my electrolytic receiver, 1,000 ohm receiver, and a telegraph instrument. In the lower box is also a 15 ampere switch. The small double pole double throw switch in front of the coil changes batteries on the coil. I also have two sets of carbon cells. The batteries are not shown in the picture.

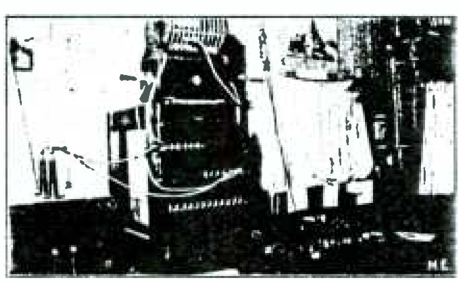
A friend of mine has a set about a mile away. We can receive all right when it comes to the electrolytic, but the fil-



ings coherer will hardly respond. My aerial is 40 feet high. I have been experimenting with wireless for four years.

Iowa. OSCAR PETERSON.

HONORABLE MENTION.



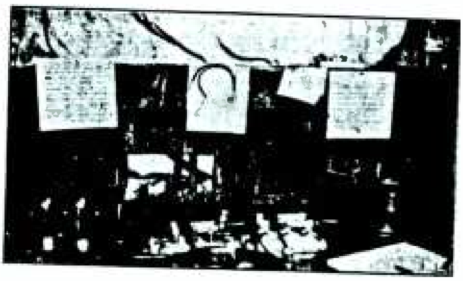
Enclosed find photos of my wireless station.

Photo No. 1 shows complete station.

Photo No. 2 shows complete receiving outfit.

I use the Massie connections, which give excellent results.

In photo No. 2, on the left, is a 3-slide tuning coil; on the right is the Massie tuning coil, with 2 slides and adjustable condenser. In the center is an electrolytic detector; the switches are for throwing in either tuning coil. Part of the head phones, which are the Massie type,



can be seen in front of the two switches.

JAS. WATMER.

Montana.

A NEW SPEED INDICATOR.

We are in receipt of a new and unique counter for taking the revolutions of shafting, dynamos, motors, etc., which has just been brought out.

The notable feature pointed out in this instrument is the clutch, consisting of two parts, which, in their normal position, are held apart by a spring provided for the purpose. When the point of the instrument is placed against the end of the shaft whose speed it is desired to measure—the counter being held in one hand and a watch in the other—the operator, at the beginning of a minute, presses on the end of the counter, whereupon the count commences. At the expiration of the minute, upon the pressure being released, the counter immediately stops. This effect, it is mentioned, is due to the separation of the two parts of the clutch by the spring mentioned above. The difference between the readings of the counter at the beginning and end of the minute represents the number of revolutions of the shaft, no arrangement being provided for setting the counter back to zero.

The company states it has purposely omitted to include a set-back device so as not to complicate the apparatus and in the belief that any such contrivance now on the market would make the counter unreliable.

Apart from these arguments, according to our judgment, there is a great advantage in this: that it is obviously easier to jot down the readings on a piece of paper, as is necessary in the present case, than to have to set back each time the

counter in an instrument calling for that somewhat tedious operation.

It is pointed out further that the counter operates equally well in either direction, adding when running one way and subtracting when running the other.

The device can also be adopted for use in connection with generators and motors as the indicator is non-magnetic. Soft rubber tips are furnished with the counter, which, being insulators, enable one to take readings of high tension dynamos and motors.

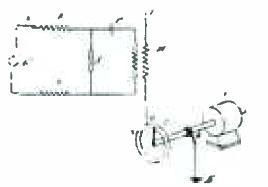
FRENCH WIRELESS TELEGRAPH AND AEROPHONE DEVICES.

(Continued from Page 18)

the transmitter, induction coil, and relays being so arranged at the master clock that signals are sent periodically by proper contacts being made at regular intervals. The Hertzian waves causing these signals to be received at the various stations provided for the purpose.

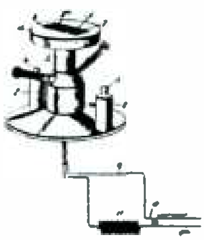
Electrical Patents for the Month

919,718. SPACE TELEGRAPHY. Lee de Forest, New York, N. Y., assignor to De Forest Radio Telephone Co., a Corporation of New York. Filed June 23, 1907. Serial No. 380,655.



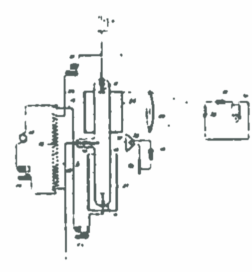
1. In a space telegraph system, a source of practically continuous electrical oscillations of frequency higher than the limit of audibility, an elevated conductor associated with said source, and means for varying said oscillations according to a simple harmonic law at a rate lower than the limit of audibility.

914,996. ELECTRIC CIGAR-LIGHTER. John W. Todd, Jr., Jackson, Miss., assignor to O. S. Johnson and C. M. Cole, Jackson, Miss. Filed Jan. 9, 1908. Serial No. 409,884.



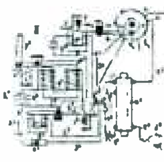
1. The combination with a casing, said casing having its top slotted, two metallic contact strips arranged therein, said strips being substantially parallel to each other and transverse to the slot and each providing a tortuous passage for an electric current, electric wires connected respectively to said strips, and insulating material packed between and around the said strips.

913,280. ELECTRIC SIGNALING. Reginald A. Fessenden, Washington, D. C. Filed Feb. 8, 1907. Serial No. 356,283.



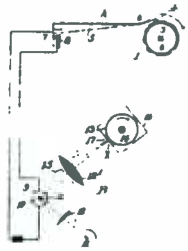
1. A receiver for electro-magnetic waves comprising an exhausted tube containing gas of the helium group.

914,483. DEVICE FOR PREVENTING COLLISIONS AT SEA. Georg Erdmann, Berlin, and Clara Fischer, Charlottenburg, Germany, guardian of Gotthold Fischer, an insane person. Filed Oct. 21, 1907. Serial No. 398,322.



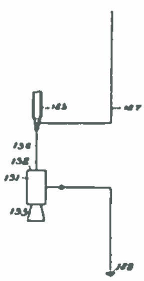
1. Apparatus for preventing collision at sea comprising in combination a self acting transmitter of electric waves located on a collidable object, means for continuously operating said transmitter, a receiver for such waves located on another collidable object being a ship, an electric circuit adapted to be closed by the action of said waves on the receiver, mechanism actuated by current flowing through the receiver circuit for stopping the engines of the ship, a second transmitter of electric waves located on the ship, and an automatic make and break switch controlled by the receiving circuit, adapted to alternately break the receiving circuit and second transmitter circuit.

918,134. TELAUTOGRAPH. Edouard Belin, Paris, France. Filed Jan. 17, 1908. Serial No. 411,284.



1. Apparatus for transmitting to a distance by telegraphic or telephonic methods any graphic representation having a surface in relief to a slight extent, comprising means for translating the variations in the relief into variations in electric intensity, means for transmitting said electrical variations to a distance, means for translating said electrical variations into variations of light intensity, and means for recording the last mentioned variations.

919,429. RECEIVER FOR ELECTROMAGNETIC WAVES. Reginald A. Fessenden, Washington, D. C., assignor by direct and mesne assignments, to The National Electric Signaling Company, Pittsburg, Pa., a Corporation of New Jersey. Original application filed July 8, 1907. Serial No. 384,738. Divided and this application filed July 1, 1908. Serial No. 324,371.



1. A receiver for electromagnetic waves consisting of a moving liquid mass.

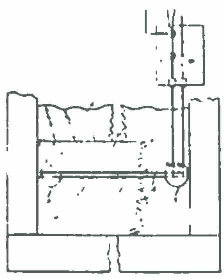
2. In a receiver for electromagnetic waves, a receiving circuit composed in part of a liquid movable in a definite path.

3. In a receiver for electromagnetic waves, detecting means including a flowing liquid.

913,899. ELECTRIC SWITCH. Ernest M. Case, Newcastle, Ind. Filed Mar. 14, 1908. Serial No. 421,040.

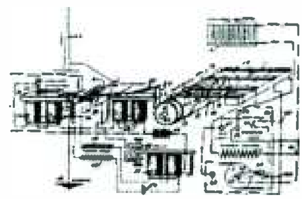
1. A switch comprising a pair of conductors having adjacent portions embedded in an insulator, and a movable member carried by one of said conductors and adapted to be moved into and out of contact with the other conductor.

914,873. ELECTRICAL INSECT-DESTROYER. Peter J. Petersen, Oakland, Cal. Filed June 15, 1908. Serial No. 438,567.



1. In a device of the character described, the combination with a window glass, of a supplemental transparent plate fixed parallel to the surface of the window glass, two pairs of parallel wires extending transversely between said glass and plate, one pair of the wires being contiguous to one surface, and the other contiguous to the other surface, and insulators by which the ends of the wires are supported.

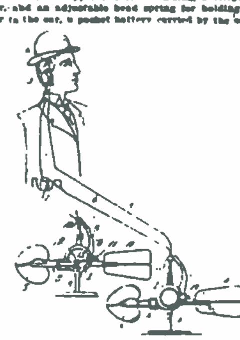
913,414. MEANS FOR CONTROLLING DIRIGIBLE TORPEDOES. Levitt R. Custer, Dayton, Ohio. Filed July 23, 1906. Serial No. 327,284.



In a system of wireless telegraphy, a transmitting station, a coherer, a single-tapping decoherer engaging said coherer, an auxiliary-vibrating decoherer engaging said coherer and adapted to create a series of vibrations in the coherer while the current is passing through said coherer until said current is interrupted, and means whereby said single-tapping decoherer and said auxiliary-vibrating decoherer are actuated when the coherer receives impulses from the transmitting station.

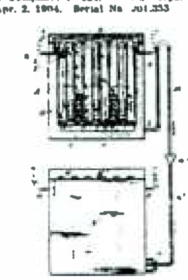
914,869. CURRENT-INDICATING APPARATUS. John S. J. Lallie, Denver, Colo. Filed Mar. 24, 1908. Serial No. 297,881.

A current indicating apparatus comprising a casing, a shaft therein, a propeller mounted on the shaft, a tail piece connected to the casing, a base upon which the casing is mounted and which is designed to rest upon the bottom of a stream of water by the current of which the propeller is actuated, a make and break device carried by the shaft, a contact to engage said device, a pivoted link connected to the upper end of the casing, a telephone receiver, and an adjustable head spring for holding the receiver to the ear, a pocket battery carried by the operator,



and electrical conductors connected to the link, one of which is connected to the casing and the other to the contact, said conductors being also connected to the battery and receiver, whereby electric impulses corresponding to the revolutions of the shaft are transmitted to the receiver substantially as specified.

913,862. GALVANIC CELL. Rabourn Jones, Toledo, Ohio, assignor, by mesne assignments, to The Jones Battery Company, Toledo, Ohio, a Corporation of Ohio. Filed Apr. 2, 1904. Serial No. 201,353.



1. In a galvanic cell, the combination of the tank or outer receptacle of concrete, provided with a ventilated cover, and internally fitted with a perforated bottom with a series of vertical bolts extending up through cross beams and stirrups, and held down by nuts onto a carbon filling, and between these bolts and forming a series of porous jars provided with a partial filling of iron particles and a silvered ribbon suspended therein, said jars alternating with carbon plates packed in place with a filling of granulated carbon and inverted carbon cups, all submerged with an electrolyte solution composed of chlorid of iron dissolved in water; the said silvered ribbons all connected by wire forming a negative terminal and the said carbon plates connected by wire forming a positive terminal, substantially as shown and described.

Original Electrical Inventions for Which Letters Patent Have Been Granted for Month Ending March 30th

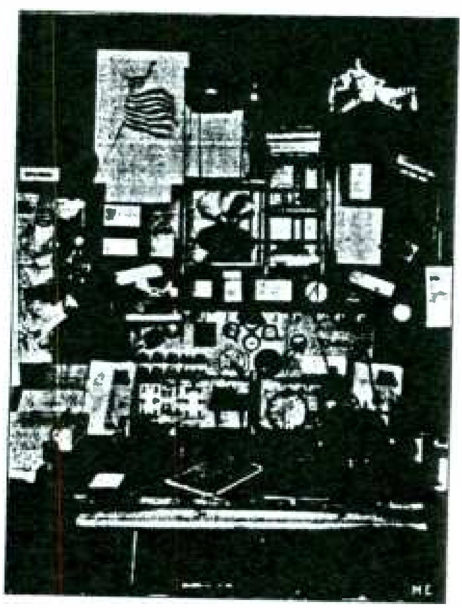
Copy of any of the above Patents will be mailed on receipt of 10 cents.

Laboratory Contest

DR. LEE DE FOREST IN HIS LABORATORY

FIRST PRIZE THREE DOLLARS.

Please find enclosed a flashlight photograph of my electrical laboratory, including switchboard and wireless apparatus. To make the description more



clear I will divide same into three parts, namely: 1. Source of power; 2. Means of controlling; 3. The apparatus.

1. Power.—The power is procured from two large 6-volt 60-ampere storage batteries with a reserve of six dry cells.

2. Controlling.—Each instrument is controlled by individual snap switches (indicating). To protect the instruments and batteries I use a double-fuse block.

3. Apparatus.—My wireless consists of a two-inch spark coil, a key, two Leyden jars, condenser and spark gap.

The receiving apparatus consists of a 500 ohm relay and a Tesla coil. So far the apparatus are young, because I have just started. In the center of the switchboard is a 1/4 inch Rhumkorff coil, a voltmeter, ammeter, reversing switch, rheostats, Geissler tubes and a small fan motor. On the shelves can be seen a large motor driving an 8-inch fan, home-made induction coil, electrical library, medical coil, etc. The windows and doors of my room are equipped with burglar alarms.

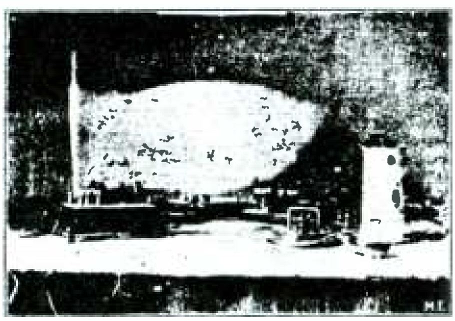
I owe many thanks to MODERN ELECTRICS, and I always try to get the first one sold in our town. I am now attending Lewis Institute, of Chicago, for the purpose of taking up electrical engineering. HAROLD E. GREEN.

Chicago, Ill.

HONORABLE MENTION.

Please find enclosed two pictures of

my laboratories, which contain both chemical and electrical supplies. I have taken great interest in wireless telegraphy and constructed a set for home use, but as I am not allowed to erect an aerial, I also have a set of telegraph instruments, motors and others. My small wireless consists of: For sending: a spark coil, and helix: for receiving, an electrolytic detector, an auto coherer, relay, the last of which I do not use for wireless as yet. In the chemical laboratory is such apparatus as crucibles, test tubes, flasks, retorts, blowpipes, beakers, Bunsen burners, supports, etc. I have all the common chemicals, as sulphur, phosphorous, iron pyrites, iodine, mercury, arsenic, also platinum, silver, sodium, and other substances and chemicals. In all I have the collection of about a hundred elements or substances all told. I keep the principal chemicals in glass stoppered reagent bottles and the other chemicals in cork stoppered



bottles. I have manufactured hydrogen, oxygen, iodine, etc., on a large scale. My laboratory grows daily, and soon will have a major part of the elements. The accompanying picture of my chemical laboratory does not show the vial case in which are kept many vials of the more costly chemicals. I use MODERN ELECTRICS every day, and have gained much information and instruction from same. JAMES D. MACFARLAND.

Mass.

W. A. O. A.

The Wireless Association of America, headed by America's foremost wireless men, has only one purpose: the advancement of "wireless." If you are not a member as yet, do not fail to read the announcement in the January issue. *No fees to be paid.*

Wireless Registry

This Department has been started with the idea to bring the wireless amateur in closer touch with commercial land and ship stations. Each month a list of new members will be printed here and once each year an official BLUE BOOK will be issued by MODERN ELECTRICS, giving a list of all the members who registered during the year. Each member will receive the Official Blue Book free of charge. The Blue Book will also contain a complete list of commercial and government stations, their call letters, wave length, etc.

To register a station requires: Total length of aerial (from top to spark balls), spark length, call letter (if none is in existence M. E. will appoint one), name and address of owner.

Fee for Registry (including one Blue Book) 25 cents.

For other particulars see June issue of this magazine.

NAME AND ADDRESS OF OWNER.	CALL LETTER	APPROXIMATE WAVE LENGTH IN METERS.	SPARK LENGTH OF INDUCTION COIL.
William Wilson, New York City,	W.W.N.	300	4 ins.
F. R. Breck, Bayonne, N. J.	F.P.S.	300	2 "
W. N. Broz, Cape May, N. J.	F.B.Z.	46	1 "
Alpha M. Koester, North Powder Ore.	M.Z.R.	35	4 "
Edward T. Eastman, West Webster, N.Y.	E.E.T.	40	1 "
R. P. Wilson, Metuchen, N. J.	R.P.W.	70	1 "
Edwin Justin, Jr. Bloomsburg, Pa.	E.T.J.	100	4½ "
C. Raymond Miller, Baldwinsville, N.Y.	C.R.M.	77	14 "
H. Bassett, Shorthills, N. J.	B.C.T.	35	1 "
J. R. Carty, Shorthills, N. J.	B.C.T.	35	1 "
A. W. Pratt, Noroton, Conn.	A. P.T.	135	2 "

BLUE BOOK.

The annual official blue book will be ready for mailing by May 1st. It contains not alone all Commercial and Government stations of the U. S. (about 500 in all), but also all stations of experimenters having registered up to May 1st, 1909.

The blue book will be of great assistance to all wireless experimenters, as it will be the only book having a complete and up-to-date list of ALL stations in the United States.

The book will have about 64 pages; pocket size. Price by mail, 10 cents each (free to members who registered). Place your order to-day.

Queries and questions pertaining to the electrical arts addressed to this department will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers. Common questions will be promptly answered by mail.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing, as *all* questions will be answered either by mail or in this department.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

Name and address must always be given in all letters. When writing only one side of question sheet must be used; not more than three questions answered at one time. No attention paid to letters not observing above rules.

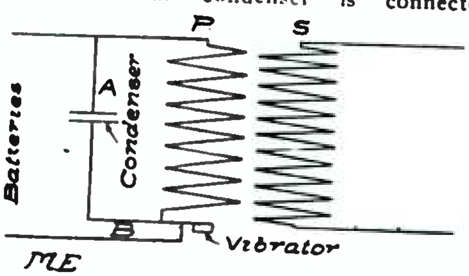
If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

CONDENSER TROUBLE.

(182.) CLARENCE KRUG, Pa., asks:

1.—I bought a 1-2 inch primary and secondary. I have the coil connected as in the cut below. The condenser consists of 3 plates of glass with four sheets of tin foil. I have the secondary well insulated, but I can hardly get a 1-4 inch spark from it. There seems to be much sparking on the vibrator. Could you tell me what is wrong with this coil?

A. 1.—Your condenser is connected



wrong. The wire A should be connected to wire B. This will obviate the trouble.

CALL BELL.

(183.) NORMAN HUFFAKER, Chicago, Ill., asks:

1.—How can a bell be attached so that it will ring when a message is coming in? What instruments are necessary?

A. 1.—You will have to use a coherer and decoherer in connection with the relay. This is the only way you can work the bell or sounder.

2.—I have a relay such as used in the block system on railroads. There are two parallel coils of 1,000 ohm resistance each. Can this with the filings coherer be connected so that it will ring a bell?

A. 2.—If the adjustment is made very carefully this will work satisfactorily.

CHARGING CONDENSER.

(184.) CLARENCE A. RUPPEL, Toledo, O., writes:

1.—Why couldn't a Tesla coil be used for wireless work?

A. 1.—Tesla coils have never been used extensively for wireless work, as it is too difficult to insulate the wiring on account of the enormous high voltage which is used. Such coils cannot be made to radiate for great distance.

2.—How many volts will I need for a relay with 1,000 ohms resistance.

A. 2.—About 3 volts.

3.—I made a Leyden jar to use on a 1-2 inch spark coil and with the arrangement given on page 144, July issue, I can't get the jar charged. I have tried charging 5 minutes and then 1 minute. The tin foil is not very straight, but it is well shellacked down; it is a pint jar, and I have followed up the instructions very carefully, but all to no success.

A. 3.—It is a mistake to try to charge a Leyden jar with a coil the same way as if you were to charge it from a static machine. To charge a Leyden jar with the coil the two brass balls connected to the Leyden jar must come very close together as the Leyden jar spark will only jump while the coil is working. No spark can be had when the coil stops working.

SPARK COIL WINDING.

(185.) O. C. T., Cleveland, Ohio, writes:

1.—In winding the secondary of an induction coil in sections, must the wire be wound on regularly like thread upon a spool or may it be wound on without regard to regularity, providing the sections are boiled in paraffine after winding?

A. 1.—Uniform winding in spark coils goes a great way. Some experimenters make the mistake to wind wire irregularly on sections and thereby lose much power from the coil when completed. It is desirable to wind the sections uniform to get best results.

2.—What size wire and how much of it will be required for a coil to give a 4 inch spark?

A. 2.—Primary 16 ounces, secondary 4 1-2 pounds.

3.—Would single cotton covered wire be all right for the secondary?

A. 3.—You should use D C C wire.

MAGNETO.

(186.) F. W. Barth, Texas, writes:

1.—I have a large size telephone magneto wound with No. 34 wire. It was run by belt at the central station. The bipolar armature is 2 inch diameter by 4 1-2 inches long. The core around which the wire was wound is 2 3-4 inches long by 3-8 inch thick (allowing for shaft, which is 3-8 inch thick at core). The two permanent magnets are 5 1-2 inches high, 1 3-4 inches wide by 1-2 inch thick steel rod (horseshoe shape).

The wire space on armature is 1 3-4 inches wide by 4 1-2 inches long.

What size magnet wire must I wind on the armature to produce the proper current to operate a 4 inch jump spark coil, with vibrator (Pittsfield) for Franklin auto; the magneto to run at high speed from flywheel.

A. 1.—We would advise you to use No. 20 or No. 22 wire, and we think this will possibly do if you wind enough wire on the armature.

WEHNELT INTERRUPTER.

(187.) Samuel Beeman, Calif.. writes:

1.—If an alternating current of 110 volts be used on a Wehnelt-Caldwell interrupter for an induction coil, what is the voltage received by the coil after it has passed the interrupter?

A. 1.—The resistance of the Wehnelt interrupter is rather low. By inserting a voltmeter it will be found that the voltage in most cases is 75 to 90 volts if the main voltage is. 110 volts.

2.—What is the resistance of the lead in a lead pencil 6 inches long?

A. 2.—It is impossible to answer this, as all makes vary considerably. The resistance may be sometimes as much as 100 ohms, but is in most cases 60 to 75 ohms.

STORAGE BATTERY.

(188.) Chester Baker, Mass.. writes, describing a battery, and asks:

1.—About how many ampere hours is it?

A. 1.—Capacity of your battery is possibly 100 ampere hours. if the battery is new. If it has been used for some time the capacity will, of course, be smaller.

2.—What is the charging current?

A. 2.—Six to eight amperes.

3. Do you suppose that the plates are packed with the same active material, both + and —?

A. 3.—Red lead is used on the positive plate, Litharge on the negative one.

WIRELESS QUERIES.

(189.) L. A. Eichmann, Iowa, asks:

1.—I intend to construct a set of wireless instruments to communicate with a friend who lives about one-third of a mile from my house. My friend is going to use a one-half inch coil in the sending apparatus, while I don't want to use any coil but a two inch one at least. Will this combination work successfully?

A. 1.—The combination is all right, but of course you understand that your friend cannot send as far as you can. However, you can both communicate with each other perfectly well. The signals received at your station will not be as strong as at your friend's station.

2.—There are two hills between my friend's house and mine. Is it necessary that the aerial be higher than the highest hill?

A. 2.—Unless the hills are very high a thirty or forty foot aerial will do.

3.—What is meant by working a spark coil with open secondary, as in Ans. 1 to query 86 in "The Oracle," October number?

A. 3.—If no spark occurs at the secondary terminals there is an open circuit which is harmful to the coil.

COIL QUERIES.

(190.) Thos. W. Gardner, Tenn., writes:

1.—I have a quantity of No. 32 enameled wire with which I wish to make an induction coil to give a 5 inch or 6 inch spark. Would you recommend using shellac to hold this wire in place? I presume this would be all right in case the separate coils. which I am planning to make about 1 1-2 inches thick, be baked thoroughly before assembling. Are any bad defects likely to result from baking the shellac too dry?

A. 1.—Some coils are made with enameled wire, but we do not think that better results can be had by shellacing same, as the baking afterward would result in blisters. which, holding air, would make poor insulation. If we were you we would wind the coil regularly and insulate with paraffine.

2.—I desire to equip an automobile with electric lights and wish to use a storage battery which I intend maintaining in a charged condition by means of a low voltage magneto driven from the fly-wheel of the engine. I would like to use some form of automatic switch that would protect the battery, when the engine is running slow, from discharge through the magneto. I would also want this automatic switch to connect the batteries again in circuit as soon as the speed of the engine gets high enough to generate a sufficient voltage in the magneto to charge the battery. The same battery will also be used for operating the induction coils. The circuit closing switch is the part of the equipment that I am having the most difficulty with. Will you please advise if there is such an automatic device made as I require? If not, can you tell me how to make one?

A. 2.—If you will write to the Electric Storage Battery Co., in Philadelphia, we think they can supply your wants.

SENDING HELIX.

(191.) J. R. Joiner, N. Y., writes:

1.—Is a sending Helix necessary?

A. 1.—A sending Helix is necessary if you wish to tune your sending instruments.

2.—Can a receiving tuning coil be used as one?

A. 2.—No; the insulation would break down.

3.—Is the length of aerial figured from the instruments. or from the ground?

A. 3.—The wave length may be figured approximately in the way mentioned in our June issue. The length figured should be from the top of the aerial to the instruments.

3-4 INCH SPARK COIL.

(192.) EDWARD R. CULLEN, N. Y.:

1.—What are the dimensions of a three-quarter (3-4) inch spark coil? Also amount of wire for secondary, etc.?

A. 1.—We give you below dimensions of a 3-4 inch spark coil.

Core 6 inches long, 3-4 inch diameter; secondary, 4 1-2 inches long, 2 9-16 inches diameter; No. 36 wire, 1 1-8 pounds; condenser, 5x2 3-4; 40 sheets tin foil.

2.—Also where I could buy an interrupter (state price), and oblige?

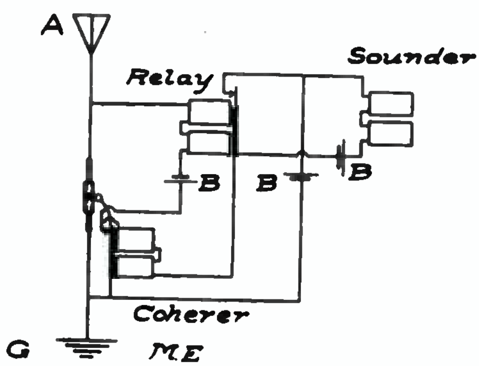
A. 2.—From the Electro Importing Co., New York.

NOVEL CALL BELL.

(193.) HUGH S. AYERS, Ills., writes:

1.—Give a diagram of a wireless telegraph using a 4 ohm giant sounder.

A. 1.—We give you below diagram how to connect sounder, coherer and decoherer system.



2.—Give a receipt for making bichromate solution.

A. 2.—Mix 1,000 parts water, 370 parts best oil of vitriol, 130 parts bichromate of potash.

3.—If I would put a vibrator on a small telephone induction coil and connect the secondaries on the line wires, could not it be used for a call system? I find when I do this it makes quite a noise in the telephone receiver.

A. 3.—We do not see how you can use the small induction coil for calling apparatus, unless you leave the telephone receiver at the receiving station in circuit all the time, as then the noise produced by your coil will possibly be sufficient to call.

RECEIVING OVER MOUNTAINS.

(194.) JAMES C. GOTTENBERG, Calif., writes:

1.—Will you please tell me how to make a machine for using paper tape, that I can use in learning to receive?

A. 1.—This will be described in the next issue.

2.—Can I receive wireless messages at Madera from the Pacific Coast? Madera is in the San Joaquin Valley, between the Coast Range and Sierra Nevada Mountains and is within two hundred (200) miles of San Francisco. Would the mountains stop the messages?

A. 2.—We hardly think the mountains would stop the messages if sensitive instruments are used. We would advise you to use a sensitive electrolytic detector, 2,000 ohm head phones, variable condenser, Potentiometer and an aerial not lower than 65 feet, preferably flat top. We are confident that with this arrangement you can receive messages.

AUTO COIL.

(195.) GEO. DUST, Salt Lake City, Utah, writes:

1.—What other instruments are necessary to use with a 1-2 inch spark coil, a microphone detector, and an ordinary telephone receiver for a wireless telegraph over the distance of about 2,000 feet?

A. 1.—We hardly think that you can cover 2,000 feet with your 1-2 inch spark coil. We should advise the use of a 1 inch coil at least.

2.—My spark coil is made for an automobile with one of the secondaries connected to one of the primaries. Does that make any difference?

A. 2.—For wireless telegraph work it is considered much better to have primary and secondary circuits not metallically connected.

3.—There are some wires crossing between the two stations carrying about 5,000 volts. Can I pass them?

A. 3.—If you have a variable condenser it is very easy to overcome the inductive effect of the wires carrying a high voltage.

WAVE LENGTH.

(196.) SEARLE ANDREWS, St. Paul, Minn., writes:

1.—Is the wave length in meters of a wireless station changed by connecting Leyden jars to the secondary of the induction coil?

A. 1.—Yes.

2.—If so, will you give me a rule for finding the wave length?

A. 2.—It is impossible to give you this information in the Oracle for lack of space. We refer you to Mavers' Wireless Telegraph Book, which treats on this subject.

3.—The enclosed sample of wire is what size?

A. 3.—Enclosed wire is No. 14 S C C.

4.—Is it suitable to be used in making a tuning coil used at the receiving station? I am going to use four pounds of it.

A. 4.—This wire is too heavy. No. 20 or No. 24 should be used.

SENDING APPARATUS.

(197.) RALPH TERRY, Wis., asks:

1.—Can I make an induction coil to work on 50 volts direct current with an electrolytic interrupter? Coil supposed to send 50 miles with 60 foot pole and 125 foot aerial.

A. 1.—An induction coil to work 50 miles in connection with an electrolytic interrupter would have to give a 6 or 8 inch spark.

2.—Would a 250 watt transformer be more practical for 50 miles than the above coil?

A. 2.—We consider a transformer better than a coil.

IDEAL BATTERY.

(198.) Clinton DeWitt, Nebr., asks:

1.—Will there be a description of how to make an alternating current motor of about 1-2 horse power in some early issue of Modern Electrics?

A. 1.—We hardly think there are many experimenters who have the means to construct such a motor.

2.—Can you give me the name and address of some company who buy electrolytic copper in small quantities?

A. 2.—Most companies buy this material in large quantities.

3.—How long will the "Ideal battery," described in August issue of Modern Electrics, last, using two amperes continually and having 1-8 inch zinc plate?

A. 3.—The battery in question gives about 350 ampere hours. By using zinc plate only 1-8 inch thick the capacity will only be about 150 to 200 ampere hours.

TWO-INCH COIL CONDENSER.

(199.) Harry Dunavan, Ft. Scott, Kan., asks:

1.—How many square inches are necessary for a condenser for a two (2) inch induction coil, and will the paper, a sample of which I enclose, be O. K. to use between the tin foil sheets?

A. 1.—You will need 2,160 square inches of tin foil for a 2 inch coil. Sample you enclosed, if well paraffined, will do.

2.—What is the principle or theory of a variable condenser connected between the aerial wire and the detector?

A. 2.—To change the capacity of the circuit.

3.—In figuring the wave length of a station do you figure the distance above the ground and also the wire on your tuning coil and aerial, or just the wire or tuning coil and aerial alone and not count the distance above ground at all?

A. 3.—We refer you to the June issue of this magazine.

WIRELESS QUERIES.

(200.) R. O. Kruse, Pa., writes:

1.—A friend and I are building a wireless set as follows: Four inch spark coil, Leyden jars and Helix. Receiving set, tuning coil, electrolytic detector, variable condenser, potentiometer and 350 ohm receivers, as sold by Electro Importing Co., with a 25 foot aerial. I am on a hill 500 feet above my friend's, 15 miles apart. Could I send to him and receive? Would 32 D C C wire be as good as 36 D C C for a 4 inch spark coil?

A. 1.—By using No. 32 D C C wire you will reduce the spark length a great deal, but with the coil, as far as wireless is concerned, you can send further on account of the spark being much heavier. It will deliver a great deal more amperage than if the wire was No. 36.

2.—There are a lot of street car lines and high buildings between us. Would it affect us?

A. 2.—We hardly think that the street car lines will affect you if suitable and sensitive instruments are used.

SELENIUM RELAY.

(201.) Raymond Sylvester, Mass., asks:

1.—Would a galvanometer of the Deprez D'Arsonval type having a resistance of 150 ohms respond when used instead of a receiver in a wireless outfit having either an electrolytic detector or a silicon detector?

A. 1.—No, this would not work.

2.—If so, would it be as sensitive as a pair of 1,000 ohm head receivers?

A. 2.—No, the telephone receiver of today is the most sensitive receiver.

3.—If so, could the galvanometer not be used for a selenium relay in connection with a selenium cell, it having of course a swinging mirror.

A. 3.—No.

ENAMELED WIRE.

(202.) Frank H. Standish, Mass., asks:

1.—How many feet to a pound of No. 24 enameled copper wire?

A. 1.—About 765 feet.

2.—How many feet is there to a pound of No. 20 enameled copper wire?

A. 2.—About 300 feet.

1-4 INCH WIRELESS COIL.

(203.) Louis Temple, Chicago, Ill., asks:

1.—What is the greatest possible distance that a message could be sent with a 1-4 inch spark coil, using dry batteries and having an aerial wire about 35 feet high?

A. 1.—About one-half mile.

2.—If condensers were used, how many and what kind would be the best to use?

A. 2.—Leyden jars will be the best to use. You cannot use more than about two pint Leyden jars with 1-4 inch coil.

3.—What would be the best antenna to use with the above coil?

A. 3.—A two wire aerial 35 feet high will possibly do. We refer you to the October and November issues of this magazine on construction of aerials.

TRANSFORMER.

(204.) Geo. McBride, Mich., asks:

1.—I have about 30 pounds of No. 20 D. C. copper magnet wire. Can I use this as a secondary for a transformer from 110 volts A. C. to high frequency current for wireless transmission, as I want a powerful spark if possible? And if this will answer, please give me the size I would have to make the core and what size primary it would take, and about how large should the condenser plates be and how many.

A. 1.—We do not think you will have much success building a transformer of this kind, as we have explained in several previous answers. It is very hard to procure the right kind of iron, and the machinery used for winding the coil of the transformer is very expensive.

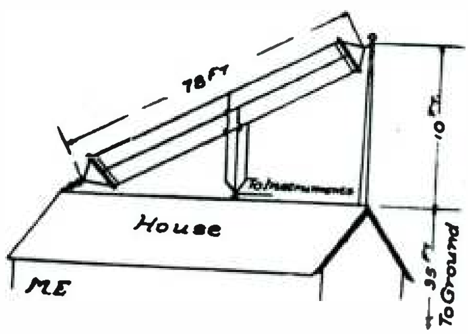
AUTO-COHERER.

(205.) W. E., New York City, asks:

1.—I have an Auto-coherer with one carbon and one iron arm and a drop of mercury between them and do not get any results at all but a loud click in the telephone receiver. The connections are all bright and clean and am using one dry cell. Can you give directions how to remedy it?

A. 1.—It is plain to us that you are using too much mercury in your detector. Use only a small drop about as large as a pinhead and be very careful so that the mercury barely touches both arms.

2.—Will an aerial as per enclosed sketch answer to receive messages about 200 miles



distant, using in connection with same a sensitive receiving set?

A. 2.—Yes; providing that the house is not surrounded by steel buildings or steel structures.

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Advertisements in this column 2 cents a word, no display of any kind. Payable in advance, stamps not accepted. Count 7 words per line. Minimum, 2 lines. Heavy face type 4 cents a word. Minimum, 3 lines.

Advertisements under "Wireless" 5 cents a word. Minimum, 4 lines. Wireless books and blueprints not listed under "Wireless" 2 cents a word.

Advertisements for the May issue must be in our hands by April 25.

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STUDY ELECTRICITY AT HOME—A complete electrical course at home, containing 30-page detail book, 220-page text-book, 200 experiments and over 100 pieces of apparatus. Price, complete, only $5.60. Catalogue "M. E. S." explains this and other remarkable offers. Thomas M. St. John, 848 Ninth Ave., New York.

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WIRELESS EXPERIMENTERS: If you are contemplating building a long distance station this spring, get our set of ten blueprints of tuned transmitting and receiving stations for 25 cents. Four wireless telephone blueprints, 15 cents. Construction blueprint of Electrolytic Detector, 15 cents. Imperial Wireless Co., 230 S. Pacific avenue, Pittsburg, Pa.

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HOW TO BUILD A WIRELESS TELEGRAPH. Set directions and blue prints, 25 cents. Miller Electric Co., Syracuse, N. Y.

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WIRELESS EXPERIMENTERS, ATTENTION! I keep the highest grade wireless and electrical supplies in stock. A call to my store will convince you of this. All up-to-date supplies. Detectors, Condensers, Spark Coils, Helixes, Gaps, Tuners, Receivers, etc., etc. Send 2c. stamp for large catalogue. M. Tanenbaum, 728A Broadway, Brooklyn, N. Y.

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WIRELESS TELEGRAPH, complete set, $10.00. Zinc spark gap, by mail, 75c. Send 2c for catalogue. Miller Electric Co., Syracuse, N. Y. Dept. R.

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SPECIAL PRICES—1,000-ohm single pole wireless receiver, $1.35; double pole, thin diaphragm, $1.75. "Eclipse" double slide 12 in. tuning coil, $2.00. Receivers postpaid. Waterhouse Bros., 5 Main street, Bourne, Mass.

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A CHOICE STOCK and the finest assortment of Wireless Telegraph supplies for the experimenter and the amateur in Philadelphia. We can save you money on all these goods and shall be only too pleased to demonstrate and explain you the philosophy and working of the apparatus' tuners, detectors, condensers, high resistance phones, coherers, etc. J. Elliott Shaw, 632 Arch St., Philadelphia, Pa.

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TWO-POLE 1,000 Ohm RECEIVERS, $1.75. Zincite and chalcopyrite, $.35, or free with every two receivers bought before the 20th. Alden Wireless Co., Campello, Mass.

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FOR SALE.

1-3 K. W. Transformer, $20.00; 10,000 volt secondary, 110 volt primary, finished complete, with all fittings, in oak case. This transformer I guarantee to send 50 miles with fair conditions. Address F. W. Falck, 204 Emerald street, Los Angeles, Cal.

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A VERY FINE Portable Wireless Receiving Set for sale; nearly new, in excellent condition, $25. Write for particulars. Allen E. Dudley, Milford, Mass.

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WANTED. Electrical and wireless apparatus for amateur. Second hand, good, and cheap. Sidney Allen, 630 Graymont, Birmingham, Ala.

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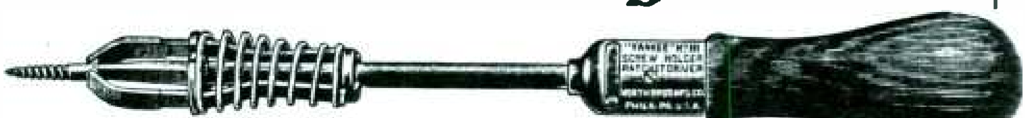

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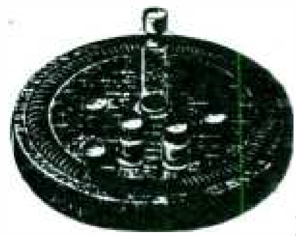

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This novel Fixed Condenser is one of the most important instruments. It is used directly in the ground and may be used with any type detector. The novelty about this Condenser is that the oak case contains 2 condensers, connected in series with one tap taken off between the two. Different capacities are therefore easily obtained.

We use a new dialectric between the heavy tin foil sheets, which static charges cannot puncture. Condensers are imbedded in paraffine. We guarantee that signals are received 10 to 25 per cent. stronger by the use of this Condenser. For diagram of connection see Cat. No. 6.

No. 10,000 Fixed Condenser Size 4¾x6⅝x1. **$1.00** By Mail extra 35c

Lack of space does not permit us to tell you all the good things you ought to know about these phones. Suffice it to say that they have been adopted by the U.S. Government the United Wireless Telegraph Co., the Marconi Wireless Telegraph Co., etc. This should be proof of their superiority. Each receiver wound to 1000 Ohms with No. 50 S.S.C. wire. Marvelously sensitive.

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No 6.

Extra!

We have bought of the bankrupt firm of Charles Lemoine & Fils, Paris, France. 5000 standard Rhumkorff Coils. This firm was well known as constructors of these coils. All coils are wound with IRON wire (a French patent) as on account of the stronger magnetic action, much less wire and space is required. The coils are unmounted, but have fibre coil heads, primary, secondary and condenser. Size over all: 3½x1½ inches. There is no vibrator, but if the primary is connected in series with an ordinary bell or buzzer a spark from 3/8 to 1/4 inch is produced, all depending on strength of battery. This we guarantee. All coils are in good condition. NOTE.—Several coils may be mounted on a longer core and when connected in series, say 4 of them, a 3/4 to 1 inch spark may be obtained. These coils cost over $1.00 to make.

Price each, as long as the supply lasts **45 CENTS.** By mail extra 10 cents

We also have over 1500 complete windings (core, primary and secondary) for medical coils, of same make as the above. These coils do **not** give a spark. No vibrator nor condenser.

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Two months ago we offered 100 2 inch coils, usually listing at $10.00, almost at cost to Modern Electrics readers. 75 have been sold so far. We have only 25 left now which will be gone before May 1st. A chance of a lifetime. Order before they are gone. The ridiculous low price, as long as the 25 Coils last is

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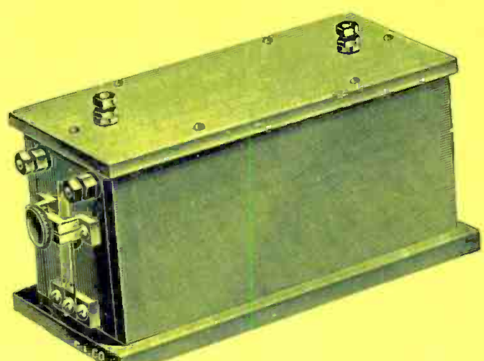

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